RAILROAD GAZETTE

FRIDAY, MARCH 2, 1900.

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Contributions.

The Hanover Experiments on Exhaust Tips.

Hanover, Feb. 6, 1900.

To the Editor of the Railroad Gazette:

In Mr. Quereau's report on exhaust and draught in locomotives, as published on pages 32 and 33 of your valuable paper, he seems to have misunderstood the purpose of our tests and the conclusions drawn from them.

The tests on our apparatus were only made to get a more general knowledge of the action of a steam jet in the stack and of the influence of proportions of parts on the vacuum obtained with a certain pressure of steam. The conclusions drawn from these tests have never been considered immediately applicable to locomotives, but the knowledge gained by these tests has done good service in numerous later tests made on locomotives actually running. All of my conclusions regarding the best dimensions of exhaust and stack have been determined only from tests of the latter kind. If Mr. Quereau had read my report in the "Organ" in 1896 he would have seen that every scientific precaution was used as to the application of the results.

I have never maintained that the steam jet would fill the stack fully. There would be no room around it for the smoke gases.

Exhaust nozzles like the Figures a, b, c, d, pages 32, Railroad Gazette, have been tried here on running locomotives, but have not shown remarkable difference in efficiency under equal conditions. On the contrary, the small bridge over the nozzle is a very efficient and easy means for securing a proper effect of the exhaust jet. For instance, all our express compound engines (48 tons) steam well and run easily with exhaust pipes of 135 millimeters (5.31 in.) diameter and a bridge 12 to 16 millimeters (.46 to .63 in.). Without that bridge they need a nozzle of much smaller free opening and of higher back pressure.

VON BORRIES.

The Education of Machinists and Mechanical Engineers.

Worcester, Mass., Feb. 2.

To the Editor of the Railroad Gazette:

My attention has been called to the interesting article in your issue of Jan. 19th, signed "W.," commenting on my paper upon the "Training of Machinists, Foremen and Mechanical Engineers." In referring to this paper, two subjects are emphasized by the writer of that article which I may be able to make clearer, and upon which my own position may be more clearly defined. The first is regarding the educational success of the training at the Worcester Polytechnic Institute, as well as the financial consideration. The second subject relates to the comparative skill required of the machinist of to-day and the machinist of thirty or forty years ago.

It is well known that the limits of a professional paper presented at a meeting of a society like that of the American Society of Mechanical Engineers forbids the treatment of all sides of such a subject as that under discussion. Moreover, the educational value and success of American technical schools is well understood, while the difficulties and the value of conducting commercially productive shops as a part of such training is not so generally acknowledged.

The Worcester School was one of the first which, from the beginning, has published from year to year the name of every graduate, together with his occupation. This list is still published as a part of the annual catalogue, which will be sent to anyone making application. The statement of these facts regarding 782 graduates from 1871 to 1898 exhibits a remarkable class of efficient and successful young men effectively engaged in all sorts of responsible positions in the manufacturing and mechanical industries throughout the country. I think the graduates of the Worcester School stand high in theoretical and scientific attainments in comparison with those of the other engineering schools, and in addition, the graduates in mechanical engineering have the advantage of a more thorough and more practical shop training than any other school has attempted to give.

Comparing the graduates of the Worcester with those of other technical schools, my observations lead me to the belief that they more promptly secure lucrative and responsible positions, that there is among them a smaller percentage of failures, that in ultimate attainments they stand fully at par, this notwithstanding their course was one of three and one-half instead of four years. I attribute these results largely to the commercial feature of their education.

Regarding the need of skilled machinists and the importance of suitable foremen, "W." says: "In the future the position of foreman should be a less difficult one to fill." And in the discussion of the paper when presented in New York the following remark was made: "I do not believe that the manual skill required of the machinist to-day is as high as that of thirty years ago." The criticism was made in this case by a college professor.

We shall certainly suffer great loss if we are allowed to be led into any such error as this. Automatic machinery, systems of piece-work and division of labor do not and will not lower the requirements of the machinist's skill and knowledge. Although these changes enable the manufacturer to make a larger use of unskilled laborers as operatives, yet, on the other hand, the requirements for skill of the machinist have been raised, not lowered. He must think more accurately, make more exact measurements, work hardened steel parts to a degree of precision that was not thought of by the old-time machinist. The skill and scientific knowledge regarding cutting tools and tempering many kinds of tools and parts of machinery have made very wonderful advances within our memory. Take, for instance, a single tool as illustration, the die for thread cutting. The old tool was properly called a "jam plate." The screw thread was made by jamming the metal into the form of a thread. There was not then knowledge enough in the shops to lead to the conception of chasing a clean full thread with a single cut with the die and removing free continuously cut chips from the iron or steel. Such attempts were then gradually confined to jamming a poor thread on a small bolt by repeated passes. Now we see practically perfectly full, clean threads cut on rods of any length up to two inches or more in diameter. This wonderful achievement is entirely due to the advanced skill and understanding of the machinist and mechanical engineer who was a machinist before he was an engineer.

We must not be misled by the observation of automatic machinery turning out the most exact work with such rapidity when operated by a rough boy called in from the streets or from the farm. In addition to the superior skill required of the machinist to construct these automatic machines, we should remember that it is not safe to run them a single day without the presence of a skilled machinist who may be called upon to make an adjustment, to detect a mysterious fault in its action, to adopt a new form of product, or to refit or make a new member requiring exactness and an accuracy of measurement that would have been impossible to the ordinary machinist of thirty years ago. I am of the opinion that if all our present improved automatic machinery and refined shop instruments and machine tools could have been delivered and set up in the machine shops of thirty years ago, there would not then have been skill enough to have made use of them.

Thus the use of automatic machinery, so marvellous in extent and accomplishment, may lead one to a false conclusion regarding the requirements for our future machinists. The field of the machinist has broadened so greatly that he does not find himself replaced as the newspaper compositor is replaced by the linotype operator, but he is called upon to construct hundreds of new machines to make new products. If an automatic bolt cutter, for example, relieves him of a portion of his former duty, he is still needed in making the machines that are replacing hand labor in other trades. He is making automatic shoe machinery, automatic type-setting machinery, automatic sewing machines, automobiles and hundreds of machines used to fill wants not known or felt fifty years ago. He is replacing the skill in the other arts and manufactures by his own skill.

Such is the superior skill required of the machinist of to-day, in order to keep our highly organized machines working properly, that the training of machinists becomes of the greatest moment in the question of national mechanical supremacy. While France, Switzerland and Germany are giving such splendid training in development of skill among all classes of their mechanics below the mechanical engineer, we cannot fall into greater danger than that of feeling secure and confident that automatic machinery, shop systems or what not will take the place of mechanical skill and scientific shop training of our machinists. And we must not forget that the perfection of our machine tools and of our small tools and of our automatic machinery have been evolved, invented, made, improved and perfected by machinists rather than by any other class of men in the line of mechanical industry. Furthermore, this high development is the direct result of the personal observation and experience of skilled machinists in the actual performance of work by the old and poorer methods. Through their daily experience they felt the need and met it.

Just so soon as the American mechanic sits down to smoke complacently because he has an automatic machine which is kept going by a thoughtless operative, just so sure will he find himself behind in the race for mechanical supremacy.

MILTON P. HIGGINS.

Pensions on the Grand Trunk.

Montreal, Feb. 22, 1900.

To the Editor of the Railroad Gazette:

In view of the increasing interest being taken by American railroads in the formation of old age pension funds it may not be out of place to describe briefly the superannuation fund established on the Grand Trunk in 1874. The fund was incorporated by Act of Parliament under the title "The Grand Trunk Railway of Canada Superannuation and Provident Fund Association." The funds of the Association are invested in the names of three Trustees appointed by the Directors of the railroad company, and the management is by a committee consisting of three men nominated by the directors, seven principal officers of the company, ex officio, and four nominees elected triennially by ballot among the members of the Association. Membership is compulsory upon all officers, agents, operators, and the clerical staff generally, receiving a salary of $400 or more, and being not over thirty-seven years of age. The rate of contribution is two and a half per cent. monthly and the company supplements the contributions of employes by giving an equal amount each half year.

Members have the privilege of retiring from the service of the company at the minimum age of fifty-five years and receiving a pension for life, on the basis of one-sixtieth of their retiring pay for each year that they have been contributing to the fund; but such allowance must not exceed two-thirds of the average annual salary during the same period.

In the event of a member of over ten years' standing being permanently incapacitated by physical or mental infirmity from performing his duties, the Committee of Management have the power, subject to the approval of the president of the company, to grant such an allowance as in their discretion may seem advisable. Should a member leave the service at any time after contributing for ten years, he is entitled to a refund of all his contributions. If he leaves after contributing for less than ten years and more than five, he receives one-half his contributions. In the event of his retiring from the service before contributing for five years he is not entitled to any refund, unless his services have been dispensed with from causes other than fraud, misconduct or dishonesty, or his retirement is caused by ill health; in either case he receives one-half his contributions.

Prior to the year 1898, members leaving the service at any period after five years received only one-half their contributions. This was considered a hardship to the employe and the rules were amended to permit of a refund of their total contributions to employes who had been contributors for ten years or over. Should a member die, the whole amount of his contributions is paid to his widow, or if he should leave no widow, to his children or other relatives dependent on him.

The Superannuation Fund has now been in operation for twenty-five years and has emerged from the experimental stage. The rules of the Association were based largely upon the experience of similar organizations on English railroads, and it was a matter of conjecture to what extent the different conditions of this country would affect the calculations of the actuaries. At the present time the fund is in a most satisfactory condition. A number of members who otherwise would have been penniless and a burden on their relatives are now receiving pensions which enable them to spend the evening of their lives in comparative ease and comfort. Many others, again, are looking forward to the time when they may take a well-earned rest from their labors. Others less fortunate there are, who, when they had the option of joining the fund

at its inception, declined to do so, and now regret their lack of foresight.

The advantages of the pension system are more fully recognized among the railroad companies of America in proportion as competition and the struggle of life become keener. This competition, coupled with the present tendency of railroads to consolidate for the purpose of more economical administration, must have the effect of reducing the opportunities to the average employe, of improving his position by changing from one service to another, and pensions therefore conduce to permanence of employment. Under such circumstances the advantages resulting to employes from the establishment of a pension fund are very great and the prospective benefits should spur them to increased efforts in the faithful and efficient performance of their duties. At the same time the consideration that employes are approaching the superannuation age cannot rightfully have any influence upon the responsible officials when dealing with matters of discipline and efficiency. H. S.

Pennsylvania Railroad Relief Department.

The Chairman of the Advisory Committee has issued the 14th annual report of the Pennsylvania Railroad Voluntary Relief Department, the same being for the year ending Dec. 31, 1899. Receipts during the year were: Balance, $257,338; contributions by members, $797,246; by companies for members disabled more than 52 weeks, $54,354; interest, $8,325; total, $1,117,264. Benefits paid, $820,490; relief beyond 52 weeks, $53,662; balance, $243,111. The surplus fund now amounts to $664,482. The beneficiaries of the late president, Mr. Frank Thomson, gave to this surplus fund the amount of his insurance, $2,500. During the 14 years that this department has been in operation the benefits paid have aggregated $6,945,171. In addition to this the railroad companies have paid $1,172,268 for operating expenses; $363,915 for benefits to persons sick more than 52 weeks, and other sums for deficiencies, making a total of $1,672,455; which, added to the payments from the fund, makes a grand total of payments of $8,617,627.

The membership in the fund at the close of the year was 48,529, equal to about 63 per cent. of the employees. The net gain in membership during the year was 3,388. The number of members who left the service during the year was 8,319. The death rate in 1899 was 12.7 per 1,000; average number constantly disabled, 40.3 per 1,000.

A Relief Department on the Southern Pacific.

President C. P. Huntington, of the Southern Pacific, announces the establishment, on the first of this month, of a department to maintain an employes' relief fund. His circular says:

"This will be a department of the company's service to be known as the Relief Department. It will be placed in charge of Mr. A. F. Hess, as Superintendent, with headquarters at San Francisco, Cal. There will be an Advisory Committee composed of representatives of the employes and of the company.

"The object of this department is the establishment and management of a fund, to be known as the Relief Fund, for the payment of definite amounts to contributing employes who, under the regulations, shall be entitled to relief when they are disabled by accident or sickness, and, in the event of death, to the relatives or other beneficiaries specified in their applications.

"The Relief Fund from which the proposed benefits are to be paid will be formed by voluntary contributions from employes, income or profit derived from investment of money in the fund, and by the payment of $36,000 per annum by the Southern Pacific Company, which thereby, in inaugurating the department, insures it from the beginning revenues equivalent to the interest at current rates on nearly $1,000,000.

"Membership is to be voluntary and without medical examination as to all employes now in the service, enabling all, regardless of age or physical condition, to avail themselves of the benefits of the department; but, as most of the expense of operation will be for the payment of sick and death benefits, it is obvious that the privilege of joining without medical examination must be limited as to time. After the lapse of a reasonable delay, therefore, membership will be dependent on age and a satisfactory medical examination.

"Applicants for employment after March 1, 1900, must become members of the Relief Department before entering the company's service.

"The General Manager will be ex-officio a member and Chairman of the Advisory Committee. . . ."

The number of officers and employes on the Southern Pacific is about 29,000.

The Baltimore & Ohio Relief Department.

This institution, now nearly 20 years old, has 31,881 members and disbursed for accident and sick benefits and for death claims during the last fiscal year $412,732. The Relief Department has three "features," the relief feature, the pension feature and the savings feature. The pension feature, which has been in existence since Oct. 1, 1884, is now an important department, the number of pensioners on the rolls at the end of the last fiscal year being 283. Payments to pensioners during the year amounted to $52,118. It appears that when the pension department was established the railroad company purposed to sustain it wholly from the company's treasury, but from the report now before us it appears that the company makes an annual contribution of a certain sum which, in this case, was $31,000 for the year; from which it would appear that the remaining $21,118 came from the treasury of the Relief Department. Only members of the Relief Department are eligible to the pension list. Retirement from the service is not compulsory, but members arriving at the age of 65 have the privilege of retiring and availing themselves of a pension. The company has, of course, the privilege of retiring an employe who is deemed to be disqualified by age. The number of employes old enough to retire has recently increased so rapidly that pensions have not been paid to all who are entitled to the privilege, but it is likely that the directors of the railroad company will soon take action providing for this deficiency. The total amount paid to pensioners in the 15 years has been $456,488. The allowances to ordinary pensioners are made by the day and are equal to half the sums allowed for sick benefits. For an employe who has received $35 a month or less the rate is 25 cents a day; $35 to $50 a month, 50 cents a day; $50 to $75, 75 cents; $75 to $100, $1; over $100, $1.25. These rates apply to employes who have been members of the Relief Fund 10 years. If they have been members 15 years the pension is increased five per cent.: 20 years, 10 per cent.

Membership in the Relief Department is compulsory to all employes, even temporary men and probationers learning their duties, except officers receiving over $2,000 a year; clerks, etc., who are in no degree exposed to accidents in the service, and employes receiving less than $20 a month. According to the regulations of the department, the railroad company promises to pay $6,000 a year for the support of the relief feature and gives the service of its officers and employes, office room, etc.

The total amount of deposits in the Savings Feature at the end of the last fiscal year was $1,168,601. An extra dividend was declared so that all accounts drawing interest at the end of the year received 5½ per cent. per annum.

The Relief Department is managed by a committee of the Board of Directors, and there is an Advisory Committee of employes, of which the General Manager is Chairman. The Superintendent of the Department is Dr. S. R. Barr, and his office is at Relay Station, Md.

Freight Train Speeds on the Northern Pacific.

Since calling attention to the statement of Mr. Kendrick of the Northern Pacific that the adjustment of time of freight trains is one of the most promising reforms in railroad operation, we have published several important letters on the subject, notably those by Prof. W. G. Raymond and Mr. G. R. Henderson. In both cases certain conclusions have been reached from calculations involving several assumptions. The following discussion by Mr. E. H. McHenry, Chief Engineer of the Northern Pacific, is the result of several years' study of freight train operation on a road presenting the greatest variety of conditions. It may, therefore, be taken as not alone a mathematical study, but the result of investigation and actual working.

"The principal effect of high speed is the great consequent reduction in the carrying capacity of the train, and the value of this is so many times in excess of all the remaining factors that they may be disregarded without appreciable error. The locomotive horsepower may be regarded as fixed, and, as shown by the accompanying diagram of horsepower curves, the resistance overcome is in inverse proportion to the speed, theoretically varying on the lines of the hyperbolic curve; but as the train resistance also increases with speed, the reduction in train length and weight increases in a still higher ratio than indicated by the asymptotes of the diagram. The percentage of total developed power absorbed in moving the engine also increases very rapidly with higher speeds and shorter trains.

"This is strikingly illustrated in the tabulated statement of the engine rating on the Minnesota Division, in which the train of 32 loaded cars at 18 miles an hour is reduced to 7 cars at 35 miles an hour. At the higher extreme, 4.6 trains are required to transport equivalent tonnage, the effect of which on cost of transportation is sufficiently apparent. In this particular case, the economical tonnage rating and speed for engines with 55,500 lbs. on the drivers and of 400 horsepower is 1,050 tons at 18 miles an hour westbound, and 1,470 tons at 19 miles an hour eastbound. Adhesion is fully taxed at 18 miles an hour westbound and 19 miles an hour eastbound, so no gain in tonnage rating can be secured by reducing the speed below these rates, and any increase in speed above what may be called the "critical rate" requires the transformation of a certain proportion of the available horsepower into speed instead of traction, and a rapidly increasing loss in tonnage rating must follow.

"The consequent conclusions may be, perhaps, more clearly stated by saying that the most economical conditions are attained only when the tonnage rating is fixed with reference to maximum grade and maximum cylinder traction, in combination with a schedule adjusted to the available horsepower of the engine. From this, it follows that no particular speed can be fixed as economical per se, in general application, as freight train speeds above 35 miles an hour may be highly economical in one case, while in another a very low speed may be demanded. As a rule the engine horsepower is entirely neglected as a factor in calculations for tonnage ratings, whereas in practice the actual rate is more often fixed by the adopted schedule than by the cylinder tractive power. Two engine districts may have the same limiting rate of grade, but if such grades in one case are undulating and in the second case continuous, as in ordinary valley sections, it is apparent that the work required of the engine in the second case is very much greater and, with fixed horsepower capacity the schedule must be correspondingly reduced, if the same tonnage rating is to be maintained.

"In our practice, these conditions have led to a classification of engine districts into two principal classes, a distinction being made between districts on which the tonnage rating is determined by the tax on cylinder power and adhesion, and those on which the tonnage rating taxes the boiler only. The practical application of these principles will usually result in surprising economies, secured with little or no cost, as nothing more is required than the transformation of the schedules and their adjustment to the varying resistances of the districts and horsepower capacities of the engines operated. The results obtained by a reduction in the schedule speed on such

Northern Pacific Ry., Minnesota Division—First District.

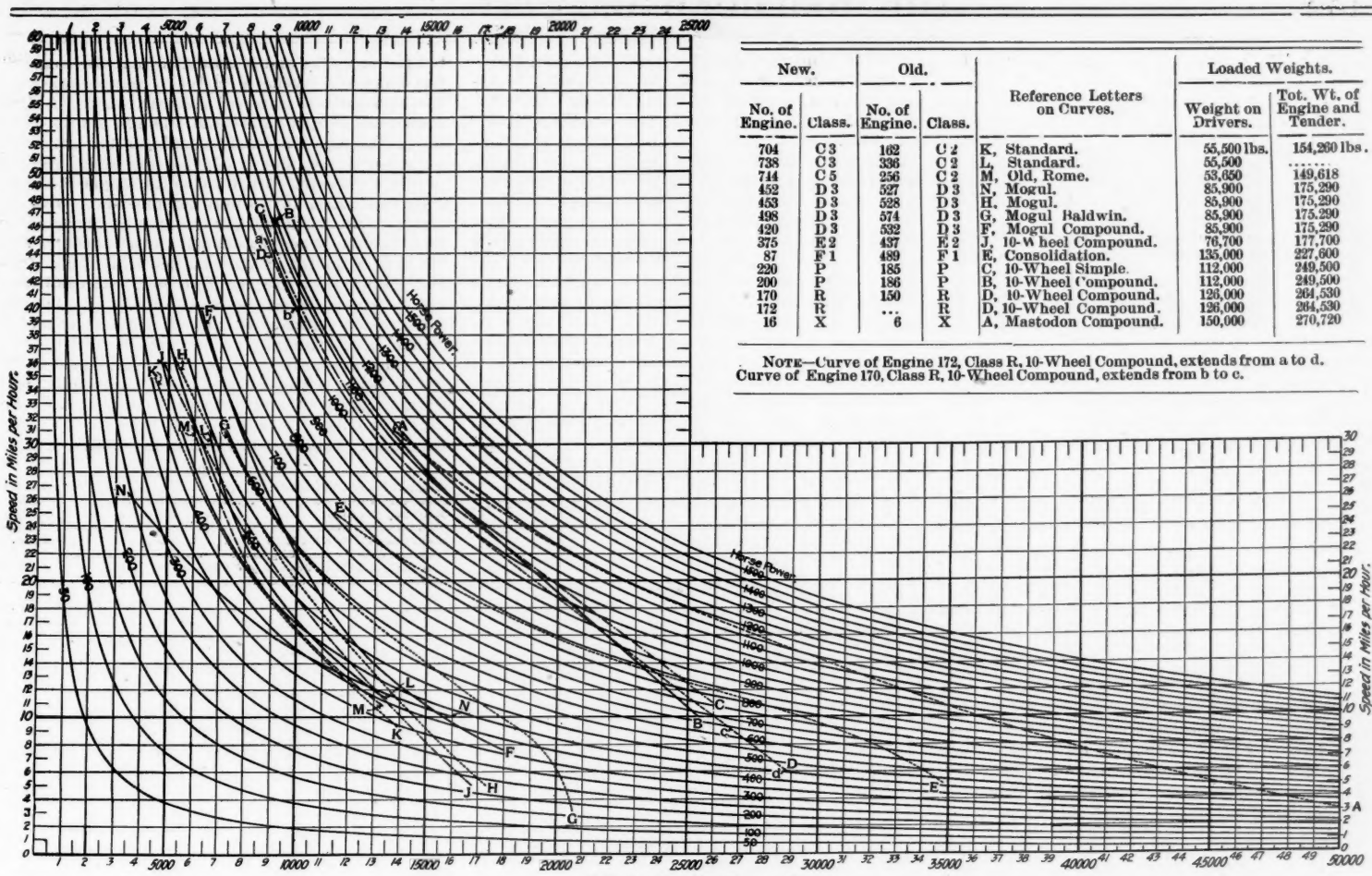
Statement showing cost of transporting cars at different speeds, engine developing 400 horse power.

	Westbound.						Eastbound.				
Speed in miles per hour.	Rolling friction and grade resistance in lbs. per ton.	Total resistance in lbs.	Gross tons hauled.	No of loads of 30 tons each.	Cost per mile. Cents.	Cost of equivalent train miles. Dollars.	Rolling friction and grade resistance in lbs. per ton.	Gross tons hauled.	No. of loads of 30 tons each.	Cost per car mile. Cents.	Cost of equivalent train miles. Dollars.
15	6.6	10,000	1,050	32	1.87	0.60	4.2	1,470	46	1.3	0.60
16	6.8	9.375	1,050	32	1.87	0.60	4.4	1,470	46	1.3	0.60
17	7.0	8,823	1,050	32	1.87	0.60	4.6	1,470	46	1.3	0.60
18	7.3	8,333	1,050	32	1.87	0.60	4.9	1,470	46	1.3	0 60
19	7.6	7,895	1,039	31	1.93	0.62	5.2	1,470	46	1.3	0.60
20	7.9	7,500	949	28	2.14	0.686	5.5	1,364	42	1.43	0.657
21	8.2	7,143	871	26	2.31	0.739	5.8	1,231	38	1.58	0.726
22	8.5	6,818	802	23	2.61	0.835	6.1	1,118	34	1.76	0.812
23	8.8	6,522	741	21	2.86	0.914	6.4	1,019	31	1.94	0.89
24	9.2	6,250	679	19	3.16	1.011	6.8	919	27	2.22	1.022
25	9.5	6,000	631	18	3.33	1.067	7.1	845	25	2.40	1 104
26	9.9	5,770	588	16	3.75	1.20	7 5	769	22	2.73	1.255
27	10.3	5,556	539	15	4.00	1.28	7.9	703	20	3.00	1.38
28	10.7	5,357	500	13	4.62	1.477	8.3	645	18	3.33	1.553
29	11.1	5,172	466	12	5.00	1 60	8.7	594	17	3.53	1.624
30	11 6	5,000	431	11	5.45	1.745	9.2	543	15	4.00	1 84
31	12.0	4,839	403	10	6.00	1.92	9.6	504	14	4.29	1 971
32	12 5	4,687	375	9	6.67	2.133	10.1	464	12	5.00	2.30
33	13.0	4,545	350	8	7.50	2.40	10.6	430	11	5.45	2 509
34	13.6	4,412	324	8	7.50	2.40	11.2	394	10	6 00	2.76
35	14.1	4,286	304	7	8.57	2.743	11.7	366	9	6.67	3 067

NOTE.—From actual tests, the rolling friction, at a speed of 21 miles per hour, is found to be 7.0 lbs. per ton, and the average grade resistance + 1.2 lbs. per ton for westbound traffic, and —1.2 lbs. per ton for eastbound traffic.

The variations in rolling friction for different speeds are taken from Wellington's diagram, showing resistance per ton for loaded cars.

NOTE: Horse power $= \frac{\text{Speed (in miles per hour)} \times \text{Traction (in Pounds)}}{375}$



New.		Old.		Reference Letters on Curves.	Loaded Weights.	
No. of Engine.	Class.	No. of Engine.	Class.		Weight on Drivers.	Tot. Wt. of Engine and Tender.
704	C 3	162	C 2	K, Standard.	55,500 lbs.	154,260 lbs.
738	C 3	336	C 2	L, Standard.	55,500	.....
744	C 5	256	C 2	M, Old, Rome.	53,650	149,618
452	D 3	527	D 3	N, Mogul.	85,900	175,290
453	D 3	528	D 3	H, Mogul.	85,900	175,290
498	D 3	574	D 3	G, Mogul Baldwin.	85,900	175,290
420	D 3	532	D 3	F, Mogul Compound.	85,900	175,290
375	E 2	437	E 2	J, 10-Wheel Compound.	76,700	177,700
87	F 1	489	F 1	E, Consolidation.	135,000	227,600
220	P	185	P	C, 10-Wheel Simple.	112,000	249,500
200	P	186	P	B, 10-Wheel Compound.	112,000	249,500
170	R	150	R	D, 10-Wheel Compound.	126,000	264,530
172	R	...	R	D, 10-Wheel Compound.	126,000	264,530
16	X	6	X	A, Mastodon Compound.	150,000	270,720

NOTE—Curve of Engine 172, Class R, 10-Wheel Compound, extends from a to d.
Curve of Engine 170, Class R, 10-Wheel Compound, extends from b to c.

Northern Pacific Railway. Diagram of Locomotive Horse Power Curves.

districts is practically equivalent to the reduction of grades on districts where the cylinder tractive power is already fully taxed.

"The results of a partial study, made in 1897, are shown in the tabulated statement of engine performances, which shows the inter-relation of speed, engine horsepower and tonnage rating, and alternatively the horsepower required to haul the full rating fixed by the maximum grades, at present schedule speed, or conversely the reduction in average speed required to effect the same purpose with the engines then in use. The actual running speeds are given, and as a schedule including stops would necessarily be still lower, the economical rates of speed as determined were found to be so low as to lead to the conclusion that it would be more practicable to provide more horsepower than to reduce speeds to the required degree, which in practice has resulted in securing a startling increase in engine efficiency, as shown by the horsepower diagram, in which all the lines indicating over 650 horsepower apply to our newer engines, with the single exception of the line for the consolidation engines, Class F-1. The efficiency of operation has been enormously increased by working along these lines, and it is believed that the proportion of horsepower to weight on engine drivers on the Northern Pacific system is the highest to be found in this country.

"There are additional expenses incidental to high speed, such as loss of time, aditional track maintenance and other items, but as previously stated, these are of minor importance. Regarding the amount and cost of loss of time, I may note an item usually overlooked and quite distinct from the additional time lost in clearing the track for high speed trains, which is the greater number of meeting points, resulting from the greater number of high speed trains required to haul equivalent tonnage. I do not think that it is commonly understood that the number of such meeting points theoretically increases as the square of the number of trains, one train each way requiring one meeting point and four trains each way 16 meeting points.

"The Northern Pacific has now obtained a complete record of the average resistances in both directions over a distance of 2,000 miles, and has also

Engine Performances, Northern Pacific Ry.

Division.	Schedule speed.	Engine rating. (Weight of engine, tender and caboose deducted.)	Average resistance.	Adhesion utilized.	Average horse power developed.	Max. train with full adhesion. (Weight of engine, tender and caboose deducted.)	Horse power required with max. train at schedule speed.	Speed with present horse power and max. train.	Water consumed.	Maximum grade.	
	Miles per hour.	Tons of 2,000 lbs.	Lbs.	Per cent.		Tons of 2,000 lbs.		Miles per hour.	Lbs. per horse power hour.	Per cent.	
West Bound:											
Eng. No. 256, Class C. 2–8-wheel–wt. on drivers = 53,650 lbs.											
Minnesota Division, North Town Junc. to Little Falls	18	959	7,412	55	356	972	357	18.	30.8	0.4	
Eng. No. 256, Class C 2–8-wheel–wt. on drivers = 53,650 lbs.											
Minnesota Division, Little Falls to Staples	16	748	6,285	47	268	826	294	14.6	30.8	0.5	
Eng. No. 516, Class D. 2–Mogul–wt. on drivers = 85,350 lbs.											
Missouri Division, Mandan to New Salem	16	600	7,921	37	338	802	435	12.4		0.95	
Eng. No. 516, Class D. 2–Mogul–wt. on drivers = 85,350 lbs.											
Missouri Division, Mile Post 40 to Hebron	15.5	1,183	11,047	51	456	1,591	602	11.8		0.4	
Eng. No. 516, Class D. 2–Mogul–wt. on drivers = 85,350 lbs.											
Missouri Division, Hebron to Richardton	16	600	8,895	42	380	765	469	13.0		1.0	
Eng. No 464, Class F. Consolidation–wt. on drivers = 96 000 lbs.											
Missouri Division, Little Missouri to Chama	15.5	730	14,182	59	586	866	681	13.3		1.0	
Eng. No. 336, Class C. 2–Standard–wt. on drivers = 55,500 lbs.						(1,007	334	11.4		0.4	By revision of grade.)
Yellowstone Division, Glendive to Forsythe	16	689	5,575	40	238	742	254	15.0		0.6	
Eng. No. 336, Class C. 2–Standard–wt. on drivers = 55,500 lbs.						(1,007	358	11.0		0.4	By revision of grade.
Yellowstone Division, Forsythe to Billings	15.5	689	6,154	44	254	856	309	12.8	30.2	0 5	
Eng. No 518, Class D. 2–Mogul–wt. on drivers = 85,350 lbs.											
Montana Division, Billings to Livingston	15	830	11,780	55	471	1,360	739	9.5	26.96	0.5	
Eng. No. 574, Class D. 3–Mogul–wt. on drivers = 85,900 lbs.											
Idaho Division, Pasco to Ellensburg	14.5	707	7,641	35.6	295	937	379	11.3	29.2	0.8	
Eng. No. 574, Class D. 3–Mogul–wt. on drivers = 85,900 lbs											
Pacific Division, Ellensburg to Easton	15.3	670	7,763	36	317	1,051	473	10.25		0.7	
Eastbound:											
Eng. No. 574, Class D. 3–Mogul–wt. on drivers = 85,900 lbs.											
Pacific Division, Tacoma to South Prairie	18.5	557	10,511	49	518	768	683	14.		1.0	
Eng. No. 574, Class D. 3–Mogul–wt. on drivers = 85,900 lbs.											
Pacific Division, South Prairie to Buckley	14	313	14,507	68	542	451	720	10.5		1 7	
Eng. No. 574, Class D. 3–Mogul - wt. on drivers = 85,900 lbs.											
Pacific Division, Buckley to Lester	15.5	438	9,635	45	400	702	593	10.4		1.1	
Eng. No. 465, Class F.–Consolidation–wt. on drivers = 96,000 lbs.						(866	503	9.3		1.0	By revision of grade.)
Missouri Division, Glendive to Beaver Hill	12.3	629	11,598	48.3	380	690	412	11.3		1.27	
Eng. No. 465, Class F.–Consolidation–wt. on drivers = 96,000 lbs.						(866	627	9.6		1.0	By revision of grade.)
Missouri Division, Medora to Fryburg	11.2	730	18,060	75	539	792	580	10.4		1.1	
Eng. No. 344, Class C. 2–8-wheel–wt. on drivers = 59,250 lbs						(919	618	9.1		0.5	By revision of grade.
Rocky M't'n Division, Missoula to Garrison	18	421	6,553	44	314	624	438	13.0		0.8	
Eng. No. 344, Class C. 2–8-wheel–wt. on drivers = 59,250 lbs.											
Rocky M't'n Division, Garrison to Elliston	11.5	401	8,888	60	272	507	330	9.5		1.0	
Eng. No 344, Class C. 2–8-wheel–wt. on drivers = 59,250 lbs.											
Idaho Division, Pasco Jct. to (Providence) Lind	16	425	7,370	50	314	470	341	14.7		1.1	
Eng. No. 344, Class C. 2–8-wheel–wt. on drivers — 59,250 lbs.											
Idaho Division, Lind to (Iona) Sprague	18	450	8,395	57	403	591	507	14.3		0.85	

compiled sheets showing the horsepower efficiency of all of its engines within practicable ranges of speed. The diagrams will show that the horsepower efficiency of engines is highest at particular speeds, varying with the class of engine, and it is interesting to note that the use of such diagrams permits engines to be designed for the best efficiency at the particular speeds at which they are intended to be operated."

New York's Canal Problem—A Discussion of the Report of the Advisory Committee.

By William G. Raymond.*

The recommendations of the Committee appointed by Governor Roosevelt to outline a policy for the State of New York to observe toward its canals are definite and positive, but there will be many persons who will not be convinced by the arguments of the Committee, who have formed opinions, which, if not altered by further discussion, will cause them to vote against the unmodified recommendations of the Committee. It seems desirable, therefore, that the report should have the widest discussion, from all standpoints, and it is the purpose of this article to oppose the recommendations of the Committee for the reasons that will appear. It must be carefully borne in mind that no attempt is made to solve New York's transportation problem, but merely to consider the solution offered by the Canal Committee on its own ground.

Considered in what seems to be the logical order, the report appears to say:

1. It is highly desirable to the State of New York that the city of New York shall maintain its commercial supremacy over all other American ports.

2. This can not be done so long as the city must take its chances in open railroad competition.

3. Cheaper transportation will develop manufacturing, particularly the iron industry, the center of which may be brought within the State.

4. Transportation by water is inherently cheaper than by rail, and the less restricted the water way the cheaper the cost of transportation.

5. If the State of New York enlarges its water way to the utmost limit, it can be sure it will offer the lowest transportation rate, and hence receive an increasing share of the export business.

6. The utmost limit is the $60,000,000 one thousand ton barge canal proposed, hence the recommendation.

The details of finance and management are treated, and the policy of the State in management is considered to be of vital importance to the project.

1. It is doubtful if anyone will dispute the statement that it is desirable to the State of New York that the city of New York shall maintain its commercial supremacy over other American ports. It is desirable, but how desirable? To the extent of twenty-five or thirty millions of dollars? Is it worth this to the State outside the city just to maintain the supremacy of the city? The Committee expressly disclaims any idea hat the city will lose in absolute volume of business, and asserts that it will lose only in relative volume, if the canal is not built. How much is it worth to the merchant of Syracuse, six miles off the canal, beyond gratification of pride, to maintain the supremacy of New York City as a port? How much is it worth to the wage earner of Rochester who owns a home worth, perhaps, $3,000? Is it worth $3 a year? It would cost him this on the basis of yearly cost stated by the Committee, but the Committee omits the item of maintenance and operation of the canal. This sum added will raise the cost to the wage earner mentioned to the sum of from $4 to $4.50 a year. Opinions will vary as to the worth of maintaining the the supremacy of the port of New York City, but the opinion should be practically unanimous that the State outside New York City should not pay one dollar toward this end until the city has sought to help itself by reducing port charges.

But the supremacy of the port of New York City is not the only object of the canal. It is to materially increase manufactures in New York State, especially along its route, and is to bring the center of the iron industry within the State. But is the canal necessary to do this? Is it the canal that has brought to Buffalo and Tonawanda the immense steel plants now projected or building at those places? No one can be found who will answer yes. If they are coming without the canal, why spend $60,000,000 to bring them? Why? Manifestly to maintain the supremacy of the port of New York City. This may be worth to the State what it will cost, but it certainly has not been shown.

2. The port of New York City cannot maintain its supremacy if it must take its chances in open railroad competition. This is a very positive statement, and two reasons are given for the conclusion.

From the northwestern shipping points, New York is further than the southern ports of Philadelphia, Baltimore, Newport News, and Savannah, while in Boston and Portland real estate and dockage are less costly than in New York. Considering Boston and Portland first, it is natural that real estate should be higher in New York, but why should the port charges be so much higher as to overcome the disadvantage of distance and mountain grades? If New York City finds its business leaving it because of high terminal charges, it must adopt the policy of the railroad, and charge what the traffic will bear.

Distance is a very much smaller factor in the actual cost of rail transportation than is the grade of the road. A few more miles to operate is a comparatively small matter, while several more trains over the whole road, which may result from very small differences in grades, is a far more serious consideration. The statement is ventured that there is no rail route between Chicago and the Atlantic coast on which the cost of hauling a ton of freight through is as little as it is on the Lake Shore—New York Central route. Why, then, in open rail competition, should New York suffer? There is perhaps one reply: There is no such thing as open rail competition. Private contracts with large shippers do tend to bring about such competition, but such agreements are contrary to law, and it is believed are of decreasing number. Private monopoly is a curse, public monopoly a blessing. When competing natural monopolies combine to maintain high charges, it is time for government to exercise judicious control. But shall government do this by constructing yet another competing plant at great waste of capital, as it not infrequently prohibits private individuals from doing, or shall it by purchase, or agreement, or legislation, control he existing plants? Wisdom would seem to point to the second plan. At any rate, the report of the Committee does not seem to make clear that the proposed canal is necessary to the maintenance of the supremacy of the port of New York City.

3. Mention has already been made of the fact that the iron industry is coming to the State without the canal, and little need be said of the canal as an incentive to manufacturing enterprise, because nothing that can be said is conclusive. There will be honest opinions varying much as to the part the canal would play in the development of manufacturing industry. If it would take the part evidently supposed by the Committee, there is in this fact more reason for its building than in the supposed fact that it will maintain the supremacy of the port of New York City. But it is at least doubtful if this will be the result. The great manufacturing industries springing up around the cheap power of Niagara are not due to the canal. Neither can the fact that the Erie Canal was the large factor in the development of the great central valley of New York be used as an argument on which to predicate the development of industry in the future. The conditions are totally changed. The Erie canal was to the State of New York what the railroads have been to the West. It was built before he possibilities of railroad transportation were dreamed of; when it had to take the place of outrageously heavy wagons drawn over abominable roads. No wonder it built up the country. A fairly good railroad of forty years ago would have done the same thing. Nor can the argument be legitimately used that canal construction is favored in Europe, for rail rates are far higher there than in America, economy in rail operation much inferior, and both railroads and canals are to a large extent under government control and hence operated in harmony.

4. Transporation by water is inherently cheaper than by rail, and the less restricted the waterway the less the cost of transportation. The second part of this statement goes without argument. The truth of the first is doubtful.

That the cost of water transportation over long distances on large natural bodies of water, as the ocean and the great lakes, is cheaper than by rail, is probably true, though the margin of difference is much less than is generally supposed. But the cost of water transportation through a restricted artificial waterway is not inherently cheaper than by rail, and depends very much on the degree of restriction, the volume of traffic, and the cost of constructing, maintaining and operating the waterway. It is just as absurd to omit the elements, interest on first cost, depreciation, cost of ordinary maintenance, and operation of the permanent way, in estimating the cost of water transportation by artificial waterways as it is to omit these same elements from an estimate of the cost of rail transportation. For the State of New York to build and maintain a free waterway simply means that the State for some conceived benefit, assumes a part of the legitimate or illegitimate freight rate from the producer to the consumer. It means this, provided the rate after the canal is built is less than the rate before. If this result is not obtained, then the State has simply sunk its wealth in a useless ditch.

In discussing the cost of transportation, the Committee uses the word cost in a very loose way; one time it means charge or tariff, and another actual cost to the carrier. The two are very different and bear no relation the one to the other. The tariff is not based on the cost of service, but on what the traffic will bear. The Committee states that on the ocean, where the waterway is entirely unrestricted and maximum vessels may be used, the rate averages one-half mill per ton mile; on the lake, $^6/_{10}$ mill per ton-mile, and it estimates that the enlarged Erie canal will develop a rate of $^2/_3$ mill per ton-mile. The average lake rate in 1898 was, on the freight through St. Mary's Falls canal, 0.79 mill per ton-mile. The wheat rate east was $^2/_3$ mill per ton-mile, and the iron ore rate was $^3/_4$ mill per ton mile. The return, or westbound rate, fixed so low to get the business, was but $^1/_4$ to $^3/_{10}$ mill per ton-mile. With an average rate of 0.79 mill per ton-mile on the lakes, or even $^6/_{10}$ mill, it is very doubtful if a rate of $^2/_3$ mill will ever be quoted on the enlarged Erie canal. It is practically certain that the rate on wheat eastbound will not be so low on the canal as on lake. Let the Committee's estimate of cost of transportation on the canal be examined. It is based on full cargoes east, and one-third cargoes west, carried in fleets of four boats, a steamer and three barges of a combined capacity of 3,900 tons of wheat, making ten trips annually. Each fleet will thus carry yearly 52,000 tons. The value of the fleet is placed at $28,500.

Season's Expenses.

Wages and subsistence	$4,000.00
Fuel, oil, waste, etc.	3,300.00
Ordinary repairs	300.00
Insurance on fleet	352.50
Insurance on down cargo	2,925.00
Miscellaneous small expenses	200.00
Interest on investment, 5 per cent.	1,425.00
Deterioration, etc., 5 per cent.	1,425.00
	$13.927.50

Cost per ton, 26 cents.

Cost per ton-mile, 0.52 of a mill.

The statement is further made that improved methods may still further reduce the cost.

It is useless to dispute the accuracy of the several items enumerated in the estimate, and they will be assumed correct. But where is the item of insurance on the return cargo? and where is the item of administration? This being an estimate of bare cost to the carrier, the item of profit is properly omitted; but this being so, the cost obtained must not be compared with quoted freight tariff, and it is manifestly unfair to develop the economic value of the proposed canal by comparing it with the present Erie canal, as the Committee has done, simply because the constitution of the State prohibits the abandonment of that canal. The constitution is not greater than the people. Moreover, this bare estimate of cost is further in error because the divisor used to obtain the ton-mile rate is too high; the total distance is not 500 miles. It is doubtful if all the freight will be through freight. The bulk of freight now carried is way, while the estimate is for fully loaded through trips east. There is nothing said of terminal charges, and the committee is uncertain as to the economy of transshipment at Buffalo.

Is it not singular that this estimate, the work of a theorist, unverified by any transportation manager responsible to his stockholders, should be accepted by the Committee, while the estimates for the cost or rail transportation made by another theorist, of presumably equal ability, should be condemned? The managers consulted by the Committee did not deny the statements of the condemned estimate.

But these errors of omission of small details are not the most important errors in computing the cost of transportation on the enlarged canal. The omission of the items of interest on first cost, mantenance, and operation of the great waterway are far more serious because such omissions are likely to mislead some people who look only at results and not at the methods of getting at those results. These omitted items are practically constant regardless of the traffic through the canal. The maintenance and operation may vary a little with the traffic, but not much. Therefore, the cost per ton-mile will depend on the tons moved and the distance these tons are carried. The Committee's estimate of the economic value of the canal is based on an annual tonnage of 10,000,000 tons. The interest on the capital to be invested figured at 3 per cent. is $1,800,000; the cost of maintenance and operation will almost certainly be more than as much more. Other estimaters add a sinking fund to provide for the ultimate uselessness of the canal. The committee adds the sinking fund to provide for the extinction of the debt in 18 years. Without any such additions, which without doubt the people must pay, it is plainly unduly favorable to the canal to estimate a perpetual annual outlay by the State of from $3,500,000 to $4,000,000. Assuming the Committee's estimate of 10,000,000 tons, which may not soon be realized, the annual charge to the State is from 35 cents to 40 cents per ton or, on the basis of the Committee's estimate of distance, from $^7/_{10}$ of a mill to $^8/_{10}$ of a mill per ton-mile. The total cost per ton-mile will thus be seen to be certainly as much as from one and one-fifth, to one and one-half mills per ton-mile. A particular point to be noted is that the State must pay by far the larger part of it, probably as much as 60 per cent. of the total legitimate cost.

It is not sufficient justification for the omission from the estimates of this important element of cost to say that the State constitution provides that the canals shall be free. The Committee was asked to outline a policy. Unless it believed that the constitution is right it should not have accepted it. The inference is, therefore, that the Committee believes

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the canals should be free; that the people should pay the greater part of the cost of transportation across the State in order to maintain the supremacy of the port of New York and develop manufactures; that the railroads shall pay a considerable portion of this charge for the privilege of having a portion of their business taken away from them. Ethically considered, this last-named policy is certainly open to criticism. Modern views of political economy regard Government as an ethical person whose acts must be based on ethical principles. It may be argued, as has been done by Prof. Haupt, that the canals will benefit the railroad just as it will the State; more business will be developed for the railroad. As has already been indicated, it is right to say that in the past, the canal has built up the business of the State, and has thus created business for the railroad. But this was done when the canal was the only known practical means of transportation. It remains to be shown that with totally changed conditions, with more railroads than are needed, with the actual cost of rail transportation almost if not quite as low as canal transportation, the same benefit to the railroad will accrue from the building of a canal as was secured to it in the past by the same agency. The Manchester ship canal may be cited as a case in point to prove that the canal benefits the railroad. The two cases have very different conditions.

It has even been asserted by some people that the New York Central Railroad will be benefited to an extent that would warrant it in paying itself the whole cost of the canal. This may be so, but it does not seem to be apparent that the practical managers of this company, responsible to its stockholders for the management of their property believe this to be true. They may be short-sighted. They use the best sight that has been given them and they are accredited in other matters with considerable discernment. To be sure, they may be lying back waiting for the State to undertake the work and thus save them the expense. If the railroad is to be damaged, can the State assume to destroy one industry of immense proportions to build another which is confessedly of less capacity, and which is established at great cost to the State? Again, suppose the canal benefits the railroad and the State, is it the only, or the cheapest, solution of the transportation problem? Why subsidize a water transportation company yet to be formed, when a less subsidy, if a regulating law would be unjust, will secure from an existing railroad the result sought?

[TO BE CONTINUED.]

The Westinghouse Friction Draft Gear.

It seems reasonable to believe that the use of heavier cars and locomotives is going to bring the Westinghouse friction draft gear and buffer into more general use as it becomes known that the important advantages of this gear, so plainly indicated by experiments, are actually realized in service. In recent issues* it has been pretty clearly shown that draft rigging repairs is an important item, and different roads have reported from 30 to 70 per cent. of all crippled cars as having defective draft rigging, and the use of larger locomotives, larger cars and heavier trains will still further increase the number of draft gear failures. The cost of modern heavy equipment is so much more that the additional first cost of the friction buffers becomes a relatively smaller item. These things should work to make the use of the friction gear more attractive to railroads than it was a few years ago.

One of the first places at which it is assumed the average road will care to use this device is at the rear of locomotive tenders, and the accompanying engravings show two recent applications to locomotives on the Union Railroad of Pittsburgh, one as applied to the tenders of six-wheel switchers having wooden sills, and the other to the metal tender sills of the noted consolidation locomotives recently built by the Pittsburgh Locomotive & Car Works. These latter engines have cylinders 23 x 32 in., driving wheels 54 in. in diameter, and weigh in working order 230,000 lbs., with 208,000 lbs. on the drivers; the weight of the engine and loaded tender is 334,000 lbs., and the maximum theoretical tractive effort at starting is about 50,000 lbs. Both of these designs make use of the Westinghouse standard friction draft gear, and having proved satisfactory in service can safely be followed as a basis for future designs.

Referring to Fig. 1, the application to wooden tender sills, it will be noted that the rear end coupler attachments are the usual yoke and follower plates, and the stops are lugs cast on the metal draft beams. The draft beams are continuous only on the upper sides, each being formed with an open-bottomed recess for the greater part of its depth to admit the friction buffer and followers. The two beams are bolted together at both ends, the bolts passing through malleable iron distance pieces. The front distance piece is also a face plate and is recessed into the end sill and forms a striking plate for the coupler. The rear distance piece is let into the center sills and a similar casting is placed just forward of the body bolster, the intervening spaces under the sills being filled with a piece of 5 x 12 in. hard timber. All these parts below the sills are securely held in place by vertical bolts. To remove the coupler it is only necessary to take down the carrier and the two longitudinal bars which close the openings in the draft beams and support the friction buffer.

Where the center sills are channels, as in Fig. 2, the sill bolts are short and extend only through the web or the flange of the channel, while long bolts are used to hold the longitudinal supporting bars. The draft beams are replaced by heavy castings bolted to the sills. These castings extend only to the end sill so that the center line of the draft gear is considerably higher than in Fig. 1, and yet the end sill is only cut away sufficiently to prevent the yoke striking. The details of the construction are clearly shown in the engraving.

The principal features of the friction buffer in the form finally adopted were described in our issue of June 10, 1898; and on October 13 last, in a general article on draft rigging, two recent designs were given, one as applied to steel cars and one as applied to wooden cars. In Fig. 3 is shown the latest arrangement of the buffer. The changes which have been made are in the minor details, that is, the angle of the wedge block is made 42 degrees instead of 38 degrees, and two preliminary springs are used instead of one, while the parts are so proportioned that the springs are not so fully compressed as before. The net result of these changes is that release is further facilitated, the life of the springs is increased and the total of all resistances is about 150,000 lbs. instead of about 170,000 lbs.

To save reference to the former description it may be said that the buffer consists of an outer cylinder, A, made of malleable iron, within which are cast V-shaped grooves in which engage 16 frictional strips, B, of forged steel. The strips are all alike and are arranged around a cylinder loosely made up of eight malleable iron segmental carriers, C, which so interlock with each other that they can only be put together in proper order. On the inside of each of these carriers is a beveled surface, and when the carriers are assembled these beveled surfaces form a hollow frustrum of an octagonal pyramid; in this

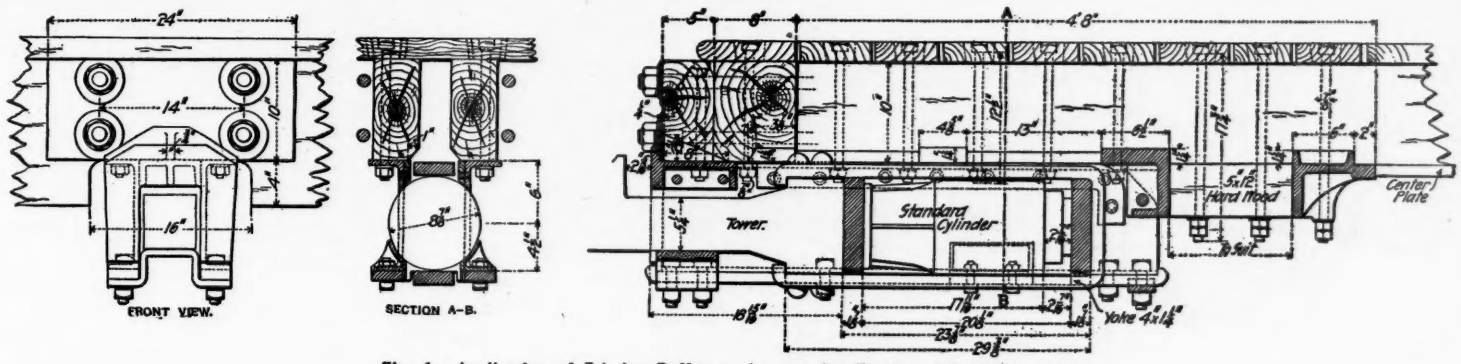


Fig. 1.—Application of Friction Buffer to Locomotive Tender with Wooden Sills.

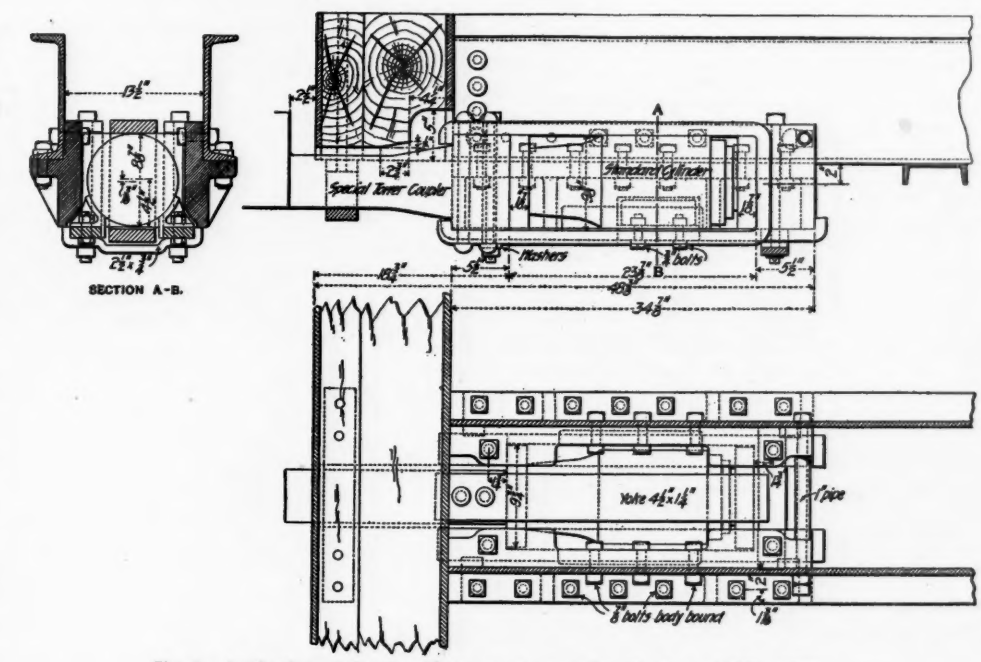


Fig. 2.—Application of Friction Buffer to Locomotive Tender with Steel Sills.

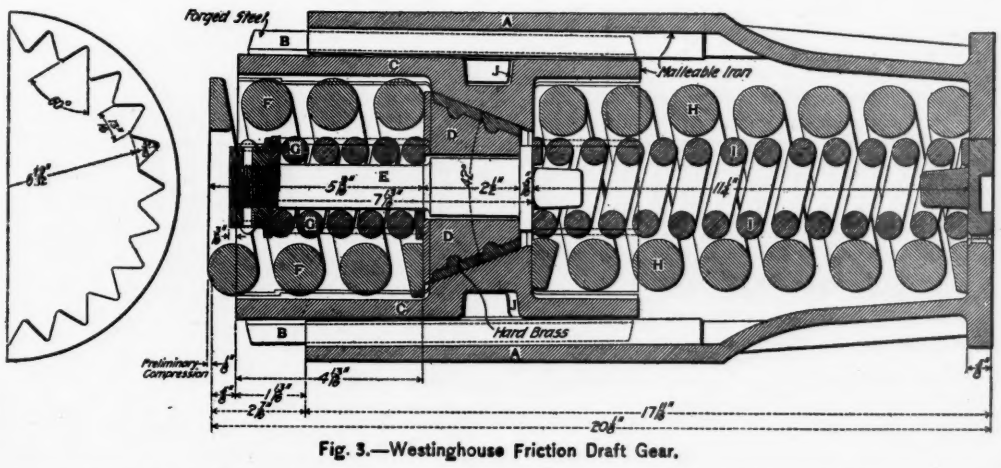


Fig. 3.—Westinghouse Friction Draft Gear.

*See Railroad Gazette, 1899, p. 703, 721, 794 and 828.

space works the wedge block, D, which is made of cast iron and faced with hard brass to prevent corrosion. The wedge block is carried loosely on a spindle or release pin, E. In the latest buffer there are four coil springs: F is the main preliminary spring and G a secondary spring, H is the release spring and I is the auxiliary release spring. The parts are so proportioned that the preliminary springs cannot be more than about one-half closed.

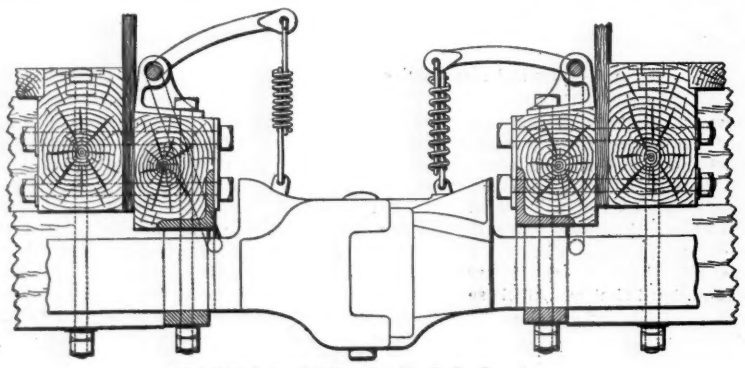
In buffing, the thrust is taken first on the head of the cylinder and is carried back through the release spring, carrier segments, the wedge block and preliminary spring to the follower. The spring reaction on the wedge block spreads the carrier segments and these in turn force the 16 frictional strips into the grooves in the outer cylinder, and so the backward movement of the cylinder is retarded by the friction of these surfaces. It will be noticed that the spring F is compressed first, and after a given travel the spring G is acted on when the follower plate comes in contact with the release pin E; further compression results in the collar of the release pin being moved out so there is then no action of the auxiliary release spring, I, on the wedge, which would tend to impair the frictional engagement between the wedge and the carrier segments. These segments bottom on the follower when the preliminary springs are about one-half closed, and then the friction of the strips in the grooves of the cylinder is the principal resistance to further movement, amounting to about five times the effect of the springs.

When the buffing force is removed, the auxiliary release spring acts on the wedge block, forcing it back and relieving the segments from the wedge action. The main release spring, acting on the segments, then begins to disengage them, picking off four strips at a time. This is accomplished through the grooves, J, in the segments, in which the lugs on the friction strips engage, being of four different lengths varying by $^1/_{16}$ in.; that is, there are four grooves of each particular length. The release spring acting against only four of these strips at a time makes their disengagement more certain and effectively prevents a violent recoil. As we have previously stated, these segments are made to interlock so that a workman can only get them together in the proper order, or so that four strips will act together. The action of the friction buffer is essentially the same under either buffing or pulling forces.

So far there is little information as to the relative cost for maintaining the friction buffer and the ordinary draft riggings at the rear of tenders, but the following figures show there is a marked difference. On one road seven six-wheel switch engines with the ordinary rear end attachments, in running 432,492 miles required repairs to the tender end sills and draft gear actually costing 81 cents per thousand miles for each engine; this cost not including the loss of service of the engines while undergoing repairs. Four similar engines, having the tenders fitted with friction buffers, in making a total mileage of 76,890 miles, cost nothing for repairs to draft rigging and end sills. Also, two very heavy freight locomotives, after running a total of 35,856 miles, had the read end attachments on the tenders removed, as the sills were badly damaged. Since the Westinghouse draft gear has been used the same engines have made 23,364 miles with no repairs, and the tender underframe is found unaffected by this usage.

The Welch Lock Lifter for Couplers.

A short time ago the Interstate Commerce Commission called attention to the large number of defects found in the unlocking gear of M. C. B. couplers, and it was shown that a good many of these defects were due to broken chains, and chains too long, making it necessary for brakemen to go between the cars for coupling and uncoupling. Another feature of the chain connection in switching is that the train must be slacked back before the lock can be raised.



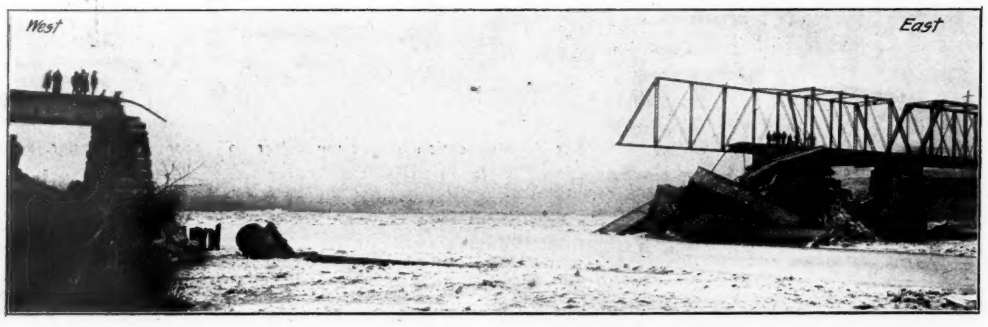
The Welch Lock Lifter for M. C. B. Couplers.

A new device, shown by the accompanying engraving, is now being put on the market by Mr. James A. Ellis of Detroit, Mich., and is intended to correct the faults of the chain connection. This is a substitute for the chain and clevis and consists of two strong steel links in combination with a coil spring making an elastic connection which does not require close adjustment. Another feature is that it can be set to raise the lock whether or not the slack is taken up, the action of the spring in this regard being shown by the coupler on the left side of the engraving. It is apparent that when the slack is extended the uncoupling lever can be set in the release position the spring connection then being compressed, and as soon as the pull is taken off the couplers the lock is raised by the spring. These attachments are now being tried by a number of roads and the Michigan Central will use them on some new pressed steel flat cars now building.

A Bridge Wreck at Terre Haute.

On the afternoon of Feb. 23 a freight train (No. 96) broke through the "Big Four" bridge over the Wabash River at Terre Haute, Ind., and nearly the whole train was wrecked. The bridge had been undermined. The Southwestern Limited express (west bound) escaped the fate of the freight by being a few minutes behind time.

The bridge was composed of four through spans of the Pratt type with spans of about 122½ ft., a short draw span and a plate girder approach at the west end. The channel of the river was originally under one arm of the draw, but for many years it has been under the fixed span next to the east bank. This channel evidently became gorged with ice, throwing the current under the fixed span west of the draw and the west arm of the draw, and the water appears to have undermined the pier at the west end of the draw.



Wreck of Freight Train at Terre Haute, February 23.

According to the statement of an eyewitness, and his testimony is substantiated by the location of the wreckage, the engine crossed the fixed span and left the track very near the pier, falling over to one side and breaking through the downstream truss of the draw, followed by cars. A little later the fixed span and the pier went down, with more cars. The photograph shows the state of the wreck about an hour and a half after the accident.

The train consisted of the locomotive and 49 cars, and 38 cars are in the river. The engineer, fireman and forward brakeman were taken out of the wreck shortly after the accident, but it is doubtful if the fireman and brakeman survive their injuries.

There are rumors that there were several tramps on the train, as well as one man with live stock, but these cannot be substantiated.

At the time of the accident there was only 7½ ft. of water in "the channel," but the depth where the accident took place is an unknown quantity.

Eight or nine years ago the fixed span next east of the draw was wrecked in a butting collision.

Rapid Transit in New York.

Last Saturday, February 24, the contract for building and working the new underground rapid transit railroad in New York was signed betwen the Rapid Transit Commissioners of New York and the contractor, Mr. John B. McDonald. The contractor and the Rapid Transit Subway Construction Company deposited with the Commissioners a certificate check for $1,000,000, securities for $1,000,000 and the bonds of various sureties for $4,000,000. The Rapid Transit Subway Construction Company was organized, it will be remembered, to back Mr. McDonald in furnishing sureties for the execution of the contract. This company was organized on Feb. 20 with August Belmont President, Walter G. Oakman Vice-President, Frederick Evans Secretary and W. C. Emmett Treasurer. Mr. Charles Sooysmith is to be Chief Engineer for the contractor. The Subway Construction Company will open offices in the Syndicate Building, Park Row.

Mr. Parsons, the Chief Engineer of the Rapid Transit Commission, will establish the office of his department at 320 Broadway, where the Commissioners have long had offices. He has selected as Deputy Chief Engineer Mr. George S. Rice, M. Am. Soc. C. E., of Boston, and this selection has been confirmed by the Rapid Transit Commissioners.

Mr. McDonald promises the newspaper reporters that work will begin on his contract about March 17, and the whole line has been divided into 15 sub-sections, as follows:

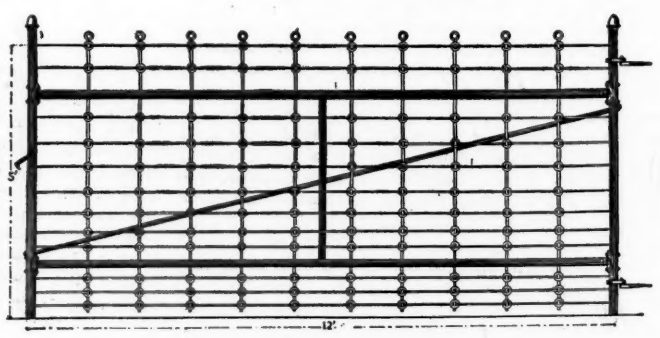
First, Post Office to center of Chambers street; second, Chambers street to Great Jones street; third, Great Jones to Thirty-third street; fourth, Thirty-third to Forty-first street; fifth, Forty-first to Sixtieth street; sixth, Sixtieth to One Hundred and Fourth street; seventh portal of tunnel at One Hundred and Third street and Broadway to One Hundred and Tenth street and Lenox avenue; eight, One Hundred and Tenth to One Hundred and Thirty-fifth street, Lenox avenue; ninth, One Hundred and Thirty-fifth street to Brook avenue: across the Harlem: tenth, east side viaduct, three miles long, beginning at Brook avenue: eleventh, One Hundred and Fourth to One Hundred and Twenty-fifth street, Broadway; twelfth, One Hundred and Twenty-fifth street to One Hundred and Thirty-third street, being the Manhattan Valley Viaduct; thirteenth, One Hundred and Thirty-third to One Hundred and Eighty-second street; fourteenth, One Hundred and Eighty-second street to Hillside avenue; fifteenth, west side viaduct.

From the composition of the Rapid Transit Subway Construction Company and from various apparently responsible interviews that have been reported in the daily press, it seems possible that there will be close relations between the Rapid Transit Commissioners, the contractor for building the road and the Long Island Railroad Company, and as an outcome from this we may hope that a way will speedily be found to complete the Long Island Railroad tunnel under the East River and Brooklyn. This project was underwritten many months ago and has only been held up by the municipal authorities of Brooklyn. It appears now that it is quite possible that a way may be found to get the necessary franchise through the aid of the New York Rapid Transit Commissioners, and the final development of the new underground road may be a traffic connection and even physical connection between this road and the Long Island and the Brooklyn Rapid Transit system.

The Chief Engineer of the Commission will proceed at once with studies for the southerly extension of the system to the lower end of the Island and Brooklyn.

The Jones Railroad Gate.

The accompanying engraving shows a right-of-way gate, made by the Jones National Manufacturing Company, Columbus, O., used largely by various railroads. The entire frame is made of 1¾-in. steel pipe, connected at the corners with malleable iron castings. Each corner casting has a ribbed plug which enters the horizontal rail, a heavy bolt pass-



The Jones Railroad Gate.

ing through both the rail and plug. Each casting also fits closely about the upright to which it is secured by two bolts, making the corners rigid. The panel work, consisting of horizontal and vertical wires, passes through holes drilled along the center lines of the pipes and at each crossing of the wires a Jones clamp is used. To make the construction still more rigid a diagonal iron rod runs from the top of the hinge post to the bottom of the swing end. The hinges consist of two heavy malleable iron clamps so arranged that the gate can be raised or lowered by the adjustment of two bolts. The gate is hung on heavy screw hooks put in one post and is fastened to the other post by a single heavy hook.

The claims made for this gate are that little time is required to hang it, it presents a good appearance and is much stronger than the ordinary metal or wood gate.

New Consolidation Locomotives for the Lake Shore & Michigan Southern.

The accompanying engraving shows one of an order of 25 consolidation locomotives built by the Brooks Locomotive Works for the Lake Shore & Michigan Southern Railway Co. In general appearance it resembles the consolidation locomotive built by the same company for the Oregon Railroad & Navigation Co., and described in our issue of February 3, 1899. The engines just built are about seven tons heavier. In each, the firebox is wholly above the frames.

The cylinders are 21 in. x 30 in., and the driving wheels are correspondingly large, being 62 in. in diameter, which is the same as on Lehigh Valley consolidation described in our issue of March 10 of last year, and which is, according to our records, the largest adopted on any consolidated engine. All the drivers have flanged tires. The total weight on the drivers is 149,000 lbs.

The boiler is of the Brooks improved extended wagon top type, designed to carry a steam pressure of 200 lbs. per sq. in. The barrel is made of steel and the horizontal seams are sextuple butt riveted. The steel firebox, which is entirely above the frames, is 121 in. long by 41 in. wide, with a depth at the front of 80 in. and at the back of 67 in. The air pump is mounted on the left side of the boiler.

The tender has some features worthy of note. It has a coal capacity for 12 tons and its U-shaped tank, which is of steel, will carry 6,000 gals. of water. Brooks 100,000-lb. truck with wheels 36 in. in diameter are under the tender. The under-frame is of Brooks 10-in. steel channel. The tender is fitted with a water scoop.

The above are the more important features of the new engines; the descriptive specifications which follow give the leading dimensions :

Type	Consolidation
Name of builder	Brooks Locomotive Works
Name of operating road	Lake Shore & Michigan Southern Ry. Co.
How many and date of delivery	25,—Dec., 1899, and Jan., 1900
Gage	4 ft. 8½ in.
Kind of fuel to be used	Bituminous coal
Weight on drivers	149,000 lbs.
" " trucks	19,000 lbs.
" total	168,000 lbs.
" tender, loaded	118,000 lbs.

General Dimensions.

Wheel base, total, of engine	25 ft. 6 in.
" " driving	17 ft. 4 in.
" " total, engine and tender	55 ft. 4¼ in.
Length over all, engine	41 ft. 5½ in.
" " " total, engine and tender	65 ft. 3 in.
Height, center of boiler above rails	9 ft. 2 in.
" of stack above rails	14 ft. 10 in.
Heating surface, firebox and arch tubes	230 sq. ft.
" " tubes	2,452 sq. ft.
" " total	2,682 sq. ft.
Grate area	33.5 sq. ft.

Wheels and Journals.

Drivers	62 in.
" material of centers	Cast steel
Truck wheels, diameter	36 in.
Journals, driving axle, main	9½ in. x 12 in.
" " " wheel fit	9¾ in.
Journals, driving axle, others	8½ in. x 12 in.
" " " wheel fit	9 in.
" truck "	6 in x 12 in.
" " " wheel fit	6½ in.
Main crank pin, size	6½ in x 6½ in.
" coupling pin, size	7¼ in. x 4½ in.
" pin, diameter, wheel fit	7⅞ in.

Cylinders.

Cylinders, diameter	21 in.
Piston, stroke	30 in.
Piston rod, diameter	3¾ in. with enlarged ends
Main rod, length center to center	142½ in.
Steam ports, length	19 in.
" width	1⅝ in.
Exhaust " length	19 in.
" " width	2¾ in.
Bridge, width	1⅝ in.

Valves.

Valves, kind of	Allen, with Richardson balance
" greatest travel	5¾ in.
" outside lap	1 in.
" inside	None
Lead in full gear, forward	3/32 negative
" constant or variable	Variable

Boiler.

Boiler, type of	Brooks improved extended wagon top
" working steam pressure	200 lbs.
" material in barrel	Steel
" thickness of material in shell	5/8 in., 11/16 in., ¾ in., 13/16 in., ½ in.
" " tube sheet	¾ in.
" diameter of barrel, front	64⅛ in.
" " " at throat	76 in.
" " at back head	65 in.
Seams, kind of horizontal	Sextuple butt
" " circumferential	Double and triple
Crown sheet, stayed with	Radial stays, with button heads
Dome, diameter, inside	30 in.

Firebox.

Firebox, type	Over frames
" length	121 in.
" width	41 in.
" depth, front	80 in.
" " back	67 in.
" material	Steel
" thickness of sheets	Tube, 5/16 in.; sides, back and top, 3/8 in.
" brick arch	On water tubes
" mud ring, width	Back, 3½ in.; sides, 4 in.; front, 4½ in.
" water space at top	Sides, 5 in.; front and back, 4½ in.
Grates, kind of	Cast iron rocking
Tubes, number of	312
" material	Charcoal iron
" outside diameter	2 in.
" thickness	No. 11 B. W. G.
" length over tube sheets	15 ft. ¼ in.

Other Parts.

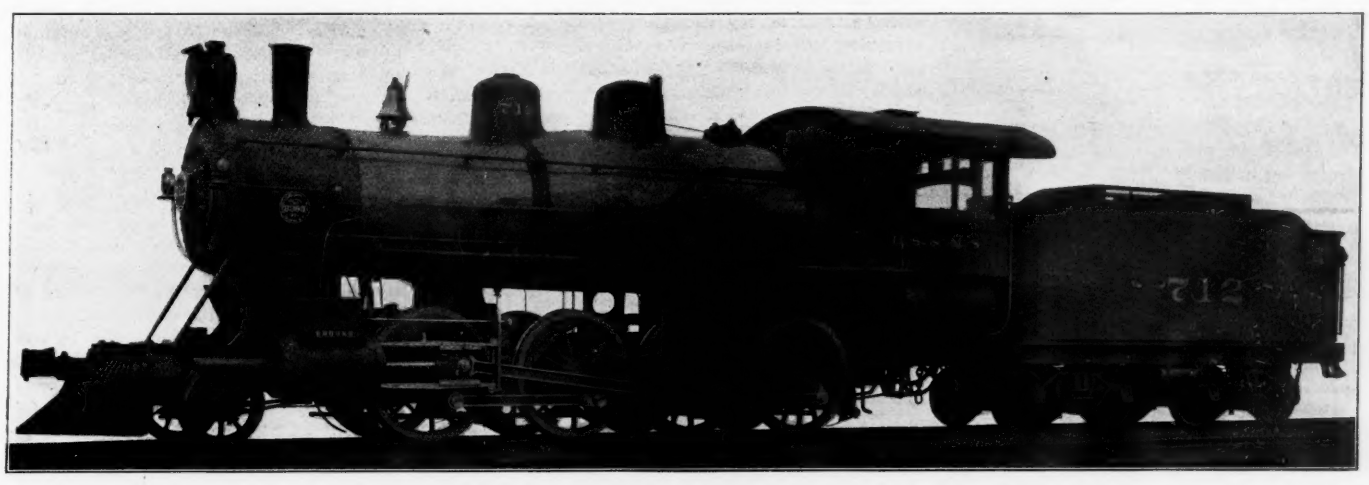
Smokebox, diameter, outside	67 in.
" length from flue sheet	65 in.
Exhaust nozzle, single or double	Single
" " variable or permanent	Permanent
" " diameter	4⅞ in., 5 in., 5½ in.
" " distance of tip below center of boiler,	2½ in.
Netting, wire or plate	Plate
" size of mesh or perforation	3/16 x 1½ x ⅜ centers
Stack, straight or taper	Steel, taper
" least diameter	15 in.
" greatest diameter	16⅞ in.
" height above smokebox	34½ in.

Tender.

Type	8-wheel, steel frame
Tank, type	"U" shape, with gravity slides
" capacity for water	6,000 gal.
" " " coal	12 tons
" material	Steel
" thickness of sheets	¼ in.
Type of under frame	Brooks 10-in. steel channel
" " truck	Brooks 100,000 lbs.
" " springs	Triplicate elliptic
Diameter of wheels	36 in.
" and length of journals	5½ in. x 10 in.
Distance between centers of journals	5 ft. 6 in.
Diameter of wheel fit on axle	6⅞ in.
" " center of axle	5⅞ in.
Length of tender over bumper beams	21 ft. 10½ in.
" " tank, inside	20 ft. 4 in.
Width " " "	9 ft. 10 in.
Height " " not including collar	5 ft. 0 in.
Type of draw gear	Brooks M. C. B. freight
Tender fitted with water scoop.	

Special Equipment.

Brakes	American for drivers, with Brooks improved arrangement of shoes on back of wheels
"	Westinghouse for tender and train service
Pump	9½ in.
Sight feed lubricators	Nathan
Safety valves	Ashton, 3½ in.
Injectors	Monitor
Springs	French
Metallic packing	United States
Couplers	Gould
Steel castings	Pratt & Letchworth Co.
Brake shoes	The Sargent Co.



Consolidation Locomotive for the Lake Shore & Michigan Southern Railway.

Built by the BROOKS LOCOMOTIVE WORKS, *Dunkirk, N. Y.* MR. W. H. MARSHALL, *Superintendent of Motive Power.*

Equalizing the Temperature in Rails.

In our issue of Feb. 16, page 99, appeared a valuable article by Mr. W. R. Webster on "Rail Steel, Its Chemistry and Heat Treatment." In the course of that article Mr. Webster mentions a suggestion made some year ago by Mr. John Fritz, namely, that just before the finishing pass the rails should be placed in a long furnace, kept at a low temperature, in order that the metal in the head might cool down slowly and that in the flange be gradually heated up to a proper finishing temperature. Mr. Webster suggests that this would overcome one difficulty, but that we might get into another in that this treatment would favor the formation of a coarse structure in the head, provided there were not enough work in the finishing pass to draw it down to a fine grain.

Concerning this Mr. Fritz says that "at the time this plan was suggested it was not the general custom to heat steel as hot as is now being done, and more time was consumed in rolling. Consequently, the rail came to the finishing pass at a temperature much lower than the temperature now, and the difficulty suggested by Mr. Webster would probably not occur. If under the present conditions such should prove to be the case, an arrangement can be made by which the head part of the rail can be rapidly cooled to a temperature low enough to avoid this trouble, namely, the formation of a coarser structure."

Of course, in what Mr. Fritz says here he is speaking of a possible treatment immediately before the finishing passes. The final work of the finishing passes would give the structure desired.

Gasoline Engine Pumping Plant.

In September of last year a gasoline engine pumping plant was installed by the New York Central & Hudson River Railroad at Catskill, N. Y. Before it was decided to adopt a gasoline engine instead of a steam engine careful estimates were made to determine the possible saving, if any.

In a word, the calculations showed that the extra cost of the gasoline plant will be made up in about a year and a half; and after that time the gasoline engine will save about 27 per cent. a year in operating expenses over a steam engine to do the same work. The engine and pump were built by Fairbanks, Morse & Co. The following is a summary of the costs and of the estimates made, for which we are indebted to Mr. W. J. Wilgus, Chief Engineer of the road. The plant was installed at the followings costs:

8 h. p. combined gasoline engine and pump		$740.00
Automatic stopping device and piping from tank		283.00
Rearrangement of water piping		126.00
New foundations		98.70
Repairing and altering pump house		167.30
Total		$1,415.00
Credit value old pump (say)	$100.00	
Credit value old boiler (say)	200.00	
		300.00
Net cost of new plant		$1,115.00

If a steam plant had been installed in place of the gasoline plant the probable cost would have been:

Duplex steam pump 10 x 6 x 10	$280.00
Vertical boiler, 16 h. p.	375.00
Steam piping	50.00
Rearrangement of water piping	126.00
New foundations	100.00
Repairing and altering old house	167.00
Total	1,098.00
Credit value of old boiler and pump	300.00
Net cost of new steam plant	$798.,00
Net cost of gasoline plant	1,115.00
Difference in first cost in favor of steam plant	$217.00

The average amount of water used per 24 hours at Catskill is 49,000 gallons. The average cost per 1,000 gallons pumped by steam was .029 cent, or about $519 a year.

The present cost of working a month is as follows:

Coal for heating house	.2 tons at	$1.75	$0.35
Gasoline	181 gals. at	.11¾	21.25
Gas engine oil	3 gals. at	.40	1.20
Light oil	½ gal. at	.08¾	.05
Waste	1 lb. at	.05	.05
Attendance, section man	75 hrs. at	.12½	9.37
Attendance, machinist	8 hrs. at	.208	1.66
Total			$33.93

Or average cost per 1,000 gals., .023 cent.

If "napthol" is used, the total average cost per month would be $30.78, or average cost per 1,000 gals., .021 cent and the total cost per year, $375. This is a saving in operation of $144 a year over a steam plant.

RAILROAD GAZETTE

ESTABLISHED IN APRIL, 1856.
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EDITORIAL ANNOUNCEMENTS.

Contributions.—*Subscribers and others will materially assist us in making our news accurate and complete if they will send us early information of events which take place under their observation, such as changes in railroad officers, organizations and changes of companies in their management, particulars as to the business of the letting, progress and completion of contracts for new works or important improvements of old ones, experiments in the construction of roads and machinery and railroads, and suggestions as to improvements. Discussions of subjects pertaining to* ALL DEPARTMENTS *of railroad business by men practically acquainted with them are especially desired. Officers will oblige us by forwarding early copies of notices of meetings, elections, appointments, and especially annual reports, some notice of all of which will be published.*

Advertisements.—*We wish it distinctly understood that we will entertain no proposition to publish anything in this journal for pay,* EXCEPT IN THE ADVERTISING COLUMNS. *We give in our editorial columns* OUR OWN *opinions, and those only, and in our news columns present only such matter as we consider interesting and important to our readers. Those who wish to recommend their inventions, machinery, supplies, financial schemes, etc., to our readers can do so fully in our advertising columns, but it is useless to ask us to recommend them editorially either for money or in consideration of advertising patronage.*

During the month of February orders for 10,543 cars and for 185 locomotives have been noted in our news columns, against orders for 5,524 cars and 165 locomotives noted in January. Of the cars noted in February, 5,310 were box, stock, furniture and refrigerator acrs; 4,410 were coal, ore and gondola cars; 560 were flat cars; 300 were steel cars and 163 were for passenger and street railroad service. About 2,800 cars, or over 25 per cent., are to be built by the railroads at their own shops. Of the 185 locomotives, 18 were for export and the division of types was approximately, 52 freight, 122 passenger and 11 switching locomotives. As indicated in our January summary these orders for rolling stock show a decided advance over the January record, but the orders are still far below those placed during the five months immediately preceding January. Especially is this true of the locomotive record. It is expected that the March orders will show a considerable increase over those above noted, as at least two large orders for cars are now under consideration.

At the last meeting of the Master Mechanics' Association, as will be remembered, an able report was presented as to the advantages of using the ton-mile as the unit of locomotive performance. Further, a resolution was passed expressing the sense of the Association that the ton-mile basis is the most practical one for motive power statistics, and its adoption was urged. The Committee was continued, to report on the most advisable method for compiling such statistics, and Mr. C. H. Quereau, Assistant Superintendent of Machinery of the Denver & Rio Grande, and a member of the Master Mechanics' Committee, has recently presented a paper before the Western Railway Club on "Ton-Mile Statistics," which is doubtless intended to draw out an expression of opinion in advance of the report to the June Convention. It is now pretty well agreed that the ton-mile is better than the car-mile as a unit for measuring locomotive performance, and the points for discussion seem now to be the proper methods for compiling such statistics. As to these methods there is considerable disagreement, but Mr. Quereau puts his conclusions very clearly: That better results will be obtained by attempting only to compare the records of one particular road with previous records made on the same road, rather than to make comparisons between roads differently situated; in the same way still better results will be obtained by confining comparisons to single divisions. The tonnage included in computing ton-mileage should be the weight of the entire train; that is including, in the case of a freight train, the locomotive, tender and caboose. The tonnage of the cars in a train should be determined by actual weighing, while that of the engine should be its weight in working order with the tender half full of coal and water. The tonnage of empty cars should be a certain per cent. greater than their actual weight, this per cent. to be determined by local conditions. The tonnage ratings for winter should be less than those for summer. The ton-mile should be the basis of statistics for all classes of engines, including freight, passenger, switching and pushers. It is advisable to group the ton-mile statistics, each service by itself. It is also advisable to separate the ton-mile statistics of branch lines from main line statistics. Mr. Quereau gives with great clearness his reasons for these conclusions, and we reprint in this issue liberal extracts from his paper.

Last Saturday the contract was signed between the Rapid Transit Commissioners of the city of New York and the contractor who undertakes for the sum of $35,000,000 to build and work the new underground railroad. We congratulate the Commissioners, and particularly their Chief Engineer, on this result. We have long been among those who have thought it doubtful if such a contract would be signed, for some years to come at any rate. The obstacles were great. Even as recently as last October, when the legislative difficulties seemed to have been cleared away and when the form of contract had been approved by the proper officers of New York City and municipal difficulties had disappeared, there were still grave business reasons to doubt if a contract would actually be made. One of the greatest obstacles was removed when the bond was reduced from $15,000,000 to $6,000,000, but other great obstacles still existed. With the many tempting opportunities for the use of capital now open it seemed doubtful if men could be found to venture their money in an enterprise so vast and involving considerable uncertainty. The present high prices of materials presented a still further obstacle, as did the difficulty of securing delivery of material, and it seemed quite possible that investors would be disposed to wait until a more favorable time. We have never looked upon the enterprise as alluring from the investor's standpoint, even when profitable opportunities were scarcer and prices lower. So far, however, the courage and persistance of the Commissioners and their Chief Engineer have been justified. To the latter, especially, we extend congratulations for his zeal, resolution and tact. To have carried the work so far as it has gone is a professional triumph. If he is fortunate enough to see it carried through to actual operation he will have built for himself a substantial monument.

In the latest issue of the Chronicle we find a compilation of railroad gross and net earnings for the calendar year 1899. This is a preliminary report on 146,261 miles and is compared with the 1898 report on 143,298 miles. In the next issue a supplementary statement will be given compiling the results from a larger mileage. In the report now presented the increase in mileage is 2 per cent., in gross earnings 10½ per cent. and in net earnings 13 per cent. Careful computation leads to the conclusion that the actual increase in gross earnings for the railroads of the United States in the calendar year will amount to 140 million dollars, and the increase in net will amount to 55 million dollars. This is the third consecutive year in which the gains have been important. The year before, namely, 1898, the gains in gross were $67,588,000, and in net $21,995,000. In 1897 the gains in gross were $55,221,000, and in net $35,919,000. In 1893 and 1894 the falling off in gross amounted to 16½ millions and 12¼ millions respectively. Among the individual roads the Pennsylvania is first in increase in gross earnings and third in increase in net earnings, the gains on that system having been 13 millions and three millions respectively. There are nine roads showing gains in gross of more than 3¾ millions each. The total Reading System shows gains in gross of more than 8¾ millions, but the gain in net is only a little over one million. The Lehigh Valley is fifth in the list in increased gross earnings, its gain amounting to 4½ millions, but in net it shows a decrease as compared with 1898 of about one-third of a million. The Atchison comes twelfth in gain in gross, that gain amounting to a little over three milion, but it is first in net, its gain in net having been almost five millions. The New York Central stands second in increase in net, amounting to $3,125,000, while its increase in gross was 4¾ millions.

Economical Freight Train Speeds.

Mr. McHenry's discussion of economical freight train speeds, in this issue, can very properly be supplemented by a few words about the investigations and improvements on the Northern Pacific, which have worked such important changes in train operation. About 10 years ago the Northern Pacific began the work of changing grades, and after the actual ruling grades on two divisions had been made the same, it was found that with similar engines heavier trains were being handled on one division than on the other. This indicated that more attention could properly be given to the effect of train momentum and led to an extensive series of dynamometer tests. When completed, these tests furnished continuous records of the drawbar pull and speed of freight trains in both directions over the entire Northern Pacific line; in all a distance of about 4,000 miles. As finally worked up, lines showing the speed, drawbar pull and tractive horsepower were superimposed on the profile, and, in addition, the indicated horsepower of the engine was shown at numerous points where diagrams were taken. Tests were also made to determine the horsepower efficiency of all classes of locomotives. These records have since formed the basis for an intelligent revision of the profile and tonnage rating, a better distribution of motive power, more suitable designs for new locomotives and other economies, all of which as carried out by the skilful men at the head of the Northern Pacific have resulted in great savings.

When this work was undertaken 350 tons was the maximum through train load west-bound, and this has now been raised to 1,350 tons for the first 900 miles west to Billings and 1,200 tons for the remaining 1,000 miles; the increased rating being obtained at a comparatively small expense. At the same time the car loadings have been increased.

We would also call attention to one other thing, which is more in the nature of a detail, and that is the keeping of graphical records. Among others a chart is prepared each year showing the freight train movement during each day. This record shows the freight trains divided into three classes with the number and tonnage of each kind of trains. These classes are: Express freight scheduled at about 30 miles an hour; time freight at about 20 miles an hour, and slow freight scheduled at about 15 miles an hour. An interesting fact brought out by the chart for the year ending June 30 last is the marked reduction over previous years in the number of express freight trains run and the increase in time freights and especially in slow freights. That is, the better adjustment of freight schedules is already under way on the Northern Pacific. In view of these things we believe Mr. McHenry's position will be better understood, and his statements certainly take the question of economical speeds out of the field of pure speculation and put it on a more substantial footing.

It would seem that the effect of high speed in reducing the train load is so great that there is no appreciable error in disregarding the remaining factors of cost, and this at once greatly simplifies the question. The economical schedule speed then becomes the highest one that can be maintained with the adhesion of the engine fully taxed, and will vary for different classes of engines, for different divisions and for either direction on the same division. If the schedule speeds are more than this a greater proportion of the available horse-power appears as speed, and the tractive power and train load are reduced, whereas if the schedule is lower than the economical speed no more tons can be hauled and nothing is gained.

It is also stated that the economical schedule speed may vary under different conditions from 35 miles an hour to very low rates. Doubtless the economical speed can only be determined by trial and yet 35 miles an hour would seem to represent exceptional conditions such as a fairly level or slightly undulating road worked with locomotives having very large boilers. Probably the conditions on the Minnesota division are nearer to those prevailing in the Central States, for which it is found that an increase of speed from 15 to 35 miles an hour, with an engine developing 400 horse-power, is followed by an increase in the cost per train mile, for equivalent tonnage, of from 60 cents to $2.74 west-bound, and $3.07 east-bound. The statement of engine performances also shows that in general, on the Northern Pacific, schedule speeds under a variety of conditions range from 11 to 18 miles an hour.

With such information as the Northern Pacific has collected a very close adjustment of schedule is possible, and engines can be assigned to suit the work of a given division, while it is just the data needed for designing new locomotives. Thus, from the dynamometer record the conditions of maximum traction and the average resistances of the whole division are known; the former fix the required weights on driving wheels, while the latter in con-

nection with the desired schedule speed determine the average horse-power required of the boiler; then knowing the average horse-power of different classes of engines it is apparent that the engine assignments can be made quite accurately and the cost of an investigation necessary t get such data as this would doubtless be saved many times over. Moreover, it would seem to be about the only way to proceed if freight train speeds are to be adjusted in a rational manner.

New Railroad Dividends.

New dividend declarations continue to be an interesting feature and result of the high level at which railroad earnings are kept. Last week the first dividend on the Baltimore & Ohio as reorganized, 2 per cent. on the preferred, was declared; the week before the Reading paid its first dividend (1½ per cent. on its first preferred shares) since its reorganization, which goes back much further than that of the Baltimore & Ohio. The Union Pacific, also a recently reorganized property, has announced its initial dividend on its common shares, the preferred issue having been on the dividend list since October, 1898, when the property had been worked by the new company for hardly six months. These are all new dividend declarations. Important companies which have announced increased rates of dividend payments are the Canadian Pacific, which has increased its half-yearly common stock dividend from 2 per cent. to 3 per cent., and the Pittsburg, Cincinnati, Chicago & St. Louis (Panhandle), which has definitely placed its preferred shares on a 4 per cent. annual basis, the semi-annual payment having been only 1½ per cent. since dividends were resumed in March, 1899. The Louisville & Nashville increased its last semi-annual dividend to 2 per cent. as compared with 1½ per cent. a year ago, when dividends were resumed after a suspension of five years.

The few weeks of the year already elapsed have been notable in point of number as well as in the prominence of the companies declaring new dividends. In addition to those already named may be mentioned the increase in the quarterly dividend of the Central of New Jersey from 1 per cent. to 1¼ per cent., putting those shares again on a 5 per cent. basis from which they were reduced in 1897. On March 1 the holders of the common shares of the Cleveland, Cincinnati, Chicago & St. Louis will receive a dividend of 1½ per cent., the first payment made since 1893, when 3 per cent. was paid. These instances show recoveries by larger companies which were not quite able to hold their own and keep up dividends with the loss of tonnage and the decline in rates since 1893, but are now able to record a balance of income far in excess of the new dividends requirements they have undertaken. Smaller companies also have profited relatively, as well as some of those of more extensive mileage. The Colorado & Southern, for instance, the new name of the Union Pacific, Denver & Gulf, reorganized only in 1899, has declared a first dividend of 2 per cent. on its first preferred shares out of the first year's surplus, which is two and a half times the dividend. In this connection may also be mentioned the first payment on the Texas & Pacific second income bonds since their issue in 1888. Nearly all these bonds, however, have now been acquired by the Missouri Pacific, and deposited as part collateral for a new issue of Iron Mountain four per cent. bonds issued last year. The Wabash also has made a payment of 3 per cent. on its series A income bonds, which have not received any interest since 1896.

All of these various payments, each of which ordinarily would be regarded as of considerable interest, are overshadowed in importance by the dividend declarations of the Baltimore & Ohio, the Reading and the Union Pacific. It would be difficult to choose three companies which represent more diverse characteristics, a greater variety of tonnage or more distinct geographical conditions. Furthermore, they are all recently organized companies and their present large earnings and financial resources, so ample in each case, afford many striking contrasts with conditions which existed but a short time ago. Their present revenues in each case afford a balance several times as large as the amount called for by the dividend declarations announced, so that the regularity of the dividend now begun seems fairly well assured. Yet each company, within a short time, has been regarded as in a practically hopeless condition, so far as its future, even under reorganization, was concerned.

On the announcement of the Baltimore & Ohio plan of reorganization in June, 1898, the old common stock dropped 5 points in one day, to 15 (a year before it had sold below 10). The assessment of $20 a share (the old second preferred was also assessed $20 and the first preferred $2) seemed to be regarded as having exhausted most of the equities in the shares. Yet the assessment was represented by the issue of new preferred, now selling around 80 and on the dividend list, while the new common, issued share for share of the old common, is quoted around 63, so that the old shareholders have witnessed a great enhancement in the value of their holdings, with a fair promise that in time the common shares will also be paying dividends. It is hardly necessary at this time to go into the developments which have brought about the enhancement in credit. One of the reasons is the extensive physical reconstruction of the property, undertaken by the receivers against the opposition of important interests among the old bondholders. Contrasting the traffic statistics of 1896, the year in which the receivership began, with those of 1899, it will be found that the tonnage carried increased by 40 per cent., and the ton mileage over 81 per cent. The average rate fell from 5.93 mills per ton-mile to 3.90 mills, but even at that abnormally low figure the freight train-mile earnings, $1.34, were above the 1896 figure. In this period the average freight train load, as reported, increased from 225 tons to 342 tons, or by 50 per cent. In the six months to December 31, the balance over fixed charges was $3,202,000, or more than equal to the full 4 per cent. annual dividend on the $60,000,000 of preferred stock authorized. In the seven months to January 31, gross receipts have increased by $2,718,000 and net, through a reduction in expenses, by $3,000,000.

The history of the Union Pacific in its main features repeats that of the Baltimore & Ohio. The reorganization dates from October, 1895; then the common stock of the old company, which was exchanged, share for share, for the common stock of the new, sold on the New York Stock Exchange for four cents on the dollar. It was assessed $15 a share, for which new preferred stock was issued at par, which is now paying 4 per cent. regularly; so that the payment on the Union Pacific shares now announced, is virtually a resumption of dividends on the stock which was so remarkably discredited a few years ago. Of course, the scaling in debt is largely responsible for the ability to pay dividends now, but the improvements of the property which have been steadily carried out under the receivership and by the new company have contributed their share in reducing the cost of transportation. In its last fiscal year the company earned a balance of $3,958,000 after paying $2,625,000 in preferred dividends. In the six months to December 31 last, net increased by $467,360, or by $832,000 including the Oregon Short Line and the Oregon Navigation companies, taken over since last July. The net earnings with these companies included, in the half year to December 31, after $3,000,000 was deducted out of income for improvements, were $12,994,500, and the surplus earnings were officially stated to be at the rate of 6 per cent. on the common shares, including the $3,000,000 charged against income for betterments and new equipment.

The Reading was more unfortunate than many of the newly reorganized roads, for, while they have had rising tonnage and revenues almost from the issuing of their reorganization plans, the new Reading was launched, when the coal production had reached a high point for the time being, and until recently it has had to contend with very depressed conditions in the coal trade. In the first seven months of its reorganization, June 30, 1897, which happened to cover the worst period of the coal trade year, its deficit was $1,243,000. In the first full fiscal year, however, its surplus was $1,376,000, and in the second year, 1899, $940,000. Each of these figures was equal to over 3 per cent. on the $28,000,000 of first preferred stock, so that the beginning of dividends has seemed only a matter of time. The balances reported, moreover, have been after charging large sums for improvements against current income. In 1899, for instance, extraordinary charges were $2,105,000, equal to over 7½ per cent. on the first preferred shares. Pretty much every prominent company can report some such deduction from current income for betterment work; such appropriations will afford large room for retrenchment when earnings fall off, without seriously interfering with dividend balances.

Los Angeles papers report that the controversy which has been raging for several weeks between the railroads and the fruit shippers concerning the routing of refrigerator cars sent East has been settled. After a conference between the shippers and the traffic officers of the Southern Pacific and the Atchison roads a paper was published which is called an "agreement" (although it appears to be signed only by the railroad companies) which provides that

1. In the matter of diversions, will endeavor to make them as satisfactory as in previous years.
2. We agree that shippers of fruit should not be interested in the cars which carry the fruit. The railroads agree to adopt that policy at the expiration of their present car contracts, which expire November 2, 1902.
3. While it is impossible to agree on the initial right to route the freight, the railroads agree that they will promote shippers' interests in the way of facilitating necessary diversion en route and securing suitable terminal deliveries at destination, provided these facilities are not used, directly or indirectly, to cut the through rates.
4. In respect to increasing the minimum weight per car, will watch it, and if fair trial should prove that it results in damage to the fruit and injury to the trade, will restore the twelve-ton minimum.
5. As to refrigerating charges, will investigate, and, if found excessive, will recommend a reasonable reduction.

It appears that a main cause of the original complaints was the alleged monopoly of private lines running refrigerator cars, and the second clause in the agreement is designed to settle this point. In the matter of diversion of cars by the railroads for the purpose of sending them over such Eastern connections as will give the most favorable return loads, the outcome appears to be a drawn game; the railroads mean to pacify the shippers while yet hoping to carry out their plan of sending shipments over the most advantageous line. It appears that shippers have routed their goods over indirect lines for the purpose of securing secret rebates, but all those shippers who took part in the conference are understood to assert that they do not care for secret rebates. The interpretation of this is, no doubt, that the shippers are precisely like railroad men in a similar situation; they all promise to refrain from secret cuts, provided all the other fellows do likewise. The fruit men say that the monopoly in refrigerator cars has imposed very high rates for ice. It is claimed that the shippers in Oregon, where there is competition in refrigerator lines, send cars through to New York at a cost, for ice, of $20 to $30, while from California the cost is $130 a car.

NEW PUBLICATIONS.

Boston Transit Commission: Fifth Annual Report, being for the year ending August 15, 1899. Secretary, B. Leighton Beal, 20 Beacon St., Boston.

The Boston Transit Commission was originally appointed for a term which should end July 2, 1899. In that year, however, the term was extended for three years from the first day of July, and last August the Commission was organized again with George G. Crocker as Chairman, Howard A. Carson as Chief Engineer and B. Leighton Beal as Secretary. The other members of the Commission are Charles H. Dalton, Thomas J. Gargan, George F. Swain and Horace G. Allen.

The work for which the Commission was first organized, namely, planning and building and putting in operation the subway, was in complete working order Sept. 3, 1898. The estimated cost of the subway as first planned in 1894 was $5,000,000. Up to the date of the report now issued the net cost is $4,141,896 and the total cost will probably not exceed $4,200,000. The results have probably been even more important than the Commissioners themselves expected. When the street cars were running on Tremont Street the limit of capacity of the surface tracks was about 200 cars an hour each way. Any increase beyond this caused congestion and blockades and the speed was often not more than two miles an hour. Within a month after the transfer of the cars from the surface to the subway the number passing freely each way rose to 282 an hour, and the speed, including stops, has risen to something between seven and eight miles an hour and cars were moved on a fixed schedule. At the date of the report now before us the operations for only 11 months can be given in full, but judging from them it is estimated that at least 50 million passengers a year are now using the subway. The Boston Elevated and the Lynn & Boston, with 400 miles of track, carry about 200 million passengers a year. The subway trackage, only five miles, carries about one-quarter as many. In passenger traffic the Park Street station of the subway is among the largest in the world. At that point 27,400,000 passengers are handled a year. The following comparison is made:

Station.	Passengers per annum.
St. Louis Union Station, St. Louis	8,000 000
Grand Central Station, New York City	14,000,000
South Union Station, Boston	21,000,000
North Union Station, Boston	23,108,384
Broad Street Station, North London Railroad	27,000,000
Park Street Station, Boston Subway	27,400,000
Waterloo Station, London & South Western	28,659,118
St. Lazare Station, l'Ouest Paris	43,062,688
Liverpool Street Station, Great Eastern, London	44,377,000

An ingenious method of indication has been introduced by which passengers standing on the platforms can know when their cars are to arrive and where the cars which they wish to board will stand and then can move at once to the proper place on the platform and thus save hurry, crowding and confusion.

The great work now ahead of the Commissioners is building the East Boston tunnel, from some suitable point on the subway to a point at or near Maverick Square in East Boston, making there a connection with the surface tracks. This tunnel will probably be about 6.500 ft. long.

The report contains some valuable information as to underground electric railroads in London and Paris and as to the capacity of the subway.

TRADE CATALOGUES.

The Gas Engine; A New Industrial Situation. With an Introduction by George Westinghouse. Pittsburgh, Pa.: The Westinghouse Companies' Publishing Department.

The Westinghouse Companies have recently issued a pamphlet entitled "A New Industrial Situation," de-

signed to set forth in a broad way some of the possibilities to be realized shortly in the wide use of gas engines. The pamphlet, quite apart from the technical information contained, is worth reading. It presents a striking instance of the part played by the creative imagination in engineering and the industrial arts. It is an example of what is occasionally done by specific, scientific knowledge and engineering skill when stimulated and directed by a capacious imagination which grasps great principles in advance of the ordinary knowledge and intelligence of the period.

Mr. Westinghouse conceives that we are now on the borders of an industrial revolution second in its effects on mankind only to that which was brought about by the discovery of practical methods of applying heat energy to the uses of mankind by the intervention of steam. It is foreseen that the steam boiler will be used only for heating purposes and the steam will be generated over gas furnaces. Gas will be used for cooking, heating and lighting, the light being got from electricity and the electric generators being driven by gas engines. Electric generators so driven will also supply power for manufacturing and for transportation. "Light, heat and power will be so much cheaper than they are now that industrial conditions will be greatly changed for the better, and with them social conditions." It is believed that the economics resulting from the distribution of gas generated at central points and carried in pipes will justify railroads in putting in gas plants, engines and electric generators to supply power for hauling their trains, particularly for metropolitan and suburban lines. Mr. Westinghouse says that "if a gas company were to supplant the present gas illumination by an equal amount of electric light obtained from gas driven dynamos it would have left for sale for other purposes over 60 per cent. of its present gas output."

It has long been recognized that gas will be the ideal fuel (1) if supplied at a practicable cost, (2) conveyed economically over long distances and (3) utilized in an engine equal to the best steam engine in speed regulation and smooth working. The second of the essential conditions was first met and conquered through the development of pipe line transportation. The third has been worked out through the invention of an adequate gas engine, while, as for the first condition, long and careful experiment justifies "the belief that within a short time gas will be commercially produced and sold at a cost so far below the lowest price now prevailing in any part of the world that, the three conditions being attained, we shall enter upon a new industrial situation." The rate for gas in London to-day is 62½ cents per 1,000 cu. ft., and in New York it has recently been 50 cents. At these rates small units can be economically worked.

A notion of the present situation of the gas engine business is given by citing several actual examples. The largest order for gas engines yet recorded comes from the Portland Cement Company, of Iola, Kan., which company has ordered 12 gas engines, aggregating 3,000 h. p. Nine of these engines are to be of 300 h. p. each and three are to be smaller. These will use ordinary gas for fuel. At Bradford, Pa., one 200 h. p. and three 125 h. p. engines are used to generate current for light and power service. These are worked by natural gas. They replace steam engines, the steam having been generated from boilers fired with natural gas. The steam plant consumed 52 ft. of gas per h. p. hour; the gas engines consume 13 ft. per h. p. hour. The Columbus Electric Company, of Columbus, O., is putting in a 650 h. p. and a 280 h. p. gas engine, each belt-connected to a Westinghouse generator. The H. K. Porter Company's locomotive works at Pittsburgh are using two gas engines of 90 and 125 h. p. respectively, direct-connected to generators. These supply current for lighting, for three large cranes, and for various motors. At Ritter & Conley's shops in Allegheny are two 125 h. p. gas engines belted to Westinghouse generators, supplying current for light and power. A little railroad belonging to the Long Island Railroad Company has been at work at Huntington for some time, using electricity as a motive power and using a Westinghouse gas engine plant in the generating station. The line is only three miles long and rises 165 ft. with grades of 1 in 22. It runs three cars in the summer and one in the winter, "so that for variability of load the conditions are about as severe as they can be." With 200 car-miles a day the gas consumption is 46 cu. ft. per car-mile and the total operating expenses, including wages of motormen and conductors, are 13 cents per car-mile. The gas here is taken from the mains of the local company at the rate of 93 cents per 1,000 cu. ft. The Carnegie Company is about to install at Homestead a 650 h. p. gas engine direct-connected to a generator to furnish electric power for the Howard Axle Works. The Niagara Lithographic Company, at Buffalo, N. Y., is using two 20 h. p. gas engines belted to shafting driving a dynamo for lighting, to run seven lithographic presses and for other purposes. The load here varies greatly, as all the presses are liable to fall into step every few minutes, and the variations of load on the engines are severe. The two gas engines work in multiple, driving the same shaft and supplying a steady lighting current in spite of the constantly changing loads. Several other examples of installations of this class are mentioned in the pamphlet.

The gas consumption in the Westinghouse engines will run about 10.5 to 12 cu. ft. of natural gas per brake h. p. hour. The engine requires from 10,500 to 12,000 thermal units for each brake h. p. hour, giving a heat efficiency at the shaft of 24.2 per cent. and 21.2 per cent. respectively. These are every day performances of engines in the hands of customers. An engine of 125 brake h. p. has used 9 cu. ft. per brake h. p. hour with an efficiency at the shaft of 28.2 per cent.

"Efficient gas engines in large units must compete successfully with the best steam engines, for it is within their ability to run night and day on 1 lb. of coal burned in a good producer gas plant per brake h. p. hour It would have to be a high grade steam engine and boiler plant that would regularly produce a brake horse power for 2 lbs. of coal per brake h. p. hour. The gas engine is no longer limited to special power purposes; it can hold its own as a prime mover."

On the Compilation of Ton-Mile Statistics.*

Comparison of Statistics.

There seems to be a quite general opinion that it is desirable and advantageous to compare the statistics of one road with those of others in order to improve records. But a comparison of the statistics of different roads is impracticable because the elements of speed, fuel, water, motive power, ratings, and prevailing weather conditions may each be as important in influencing results as the grade, and it is very doubtful if anyone would argue that our statistics should contain the necessary information concerning these items, that it would be possible to formulate a basis for our statistics which could contain all these, or, if these facts were given, would care to stake their reputations on the accuracy of the conclusions drawn.

What Tonnage Should Be Included.—There are arguments both for and against including the weight of the engine and way car in the tonnage. From a motive power standpoint it seems important to credit the engines and enginemen with all the work done, which certainly includes that absorbed by the locomotive and the caboose. Unless this is done there will be no ton-mile credit in the case of an engine running light, or with only a way car, and we know that under these circumstancee ths consumption of coal per ton-mile is greater than under other ordinary service conditions. Nor does it seem logical to charge coal and supplies, which must be done, without crediting the work performed by them. The general manager is especially interested in knowing the cost per ton-mile of hauling the net freight, almost regardless of the tonnage of the cars, engine and caboose, but it would manifestly be illogical and unfair to determine the tonnage of only the freight in the cars, whether revenue or non-revenue, as a basis for motive power statistics, as this would giv no measure of the work done. There would be no credit of ton-mileage from a train of empties, and would nullify the special claim of merit for the ton-mile basis that it is more accurate than the mile basis.

Only by including the weight of the entire train can a reasonable comparison be made between divisions or systems having heavy grades and those with comparatively light grades. On the Denver & Rio Grande, owing to the grades, the engine and way car will average about 20 per cent. of the weight of the entire train, while on a number of grades and for considerable distances they will average 35 per cent. of the total tonnage. On the Burlington road in Illinois and for a large portion of Nebraska, the proportion of the total weight of their freight trains made up by the engine and caboose is only 10 per cent. and very frequently but 8.7 per cent. It seems hardly reasonable to omit from the ton-mileage so large a proportion of the credit for the work done as 20 per cent. and expect to draw conclusions, even approximating accuracy, as to the efficiency of the motive power department, or even so small a proportion as 10 per cent.

With proper forms and a slight additional expense, ton-mile statistics can be compiled so as to give the ton-mileage of the whole train for the benefit of the motive power department, and of the contents of the cars for the operating department. The monthly expenses for compiling the ton-mileage statistics on a road operating more than 3,500 miles of track is $85, an amount too small to be considered when compared with the benefits resulting, even if double.

How Should Tonnage Be Determined?

There are roads where the tonage rating of engines is nominally in force, but in practice it is assumed that a given number of cars of a given series weighs so many tons, the reason given for this practice being the assumption that a more accurate method of determining the weight of trains would involve a useless expense. Most railroads using the tonnage rating determine the weights of their trains by taking the weights of the lading from the bills, and of the cars from the weight stenciled on them. This is better than the plan just mentioned, but the stenciled weights are not by any means accurate, and those on the way bills but little, if any, more so.

The use of self-registering scales has so extended within recent years, and the expense is so moderate, that it would seem that the actual gross weights of the cars could be obtained without prohibitive expense, and would pay in a decrease in overtime and doubling because of overloaded engines. It is also probable it would result in an increase in tonnage ratings, as the present prevailing practice of getting train weights undoubtedly results in more cases of doubling than would occur if accurate weights were to be had, and in cases of doubling undoubtedly have a tendency to reduce tonnage ratings. I believe that a sufficient allowance for the weight of the bedding in stock cars is usually not made, and this fact will account for a considerable number of cases of doubling. Frequently this bedding will weigh five tons per car.

Tonnage of Empty Cars.

Those who have studied the matter are well aware that a given tonnage of empty cars requires considerably more power than when concentrated in loaded cars, especially on level track, and at speeds more than moderate, while on grades and at slow speeds the difference is small. If ton-mile statistics are to be anywhere near accurate, there should be an allowance made, increasing the tonnage of any empty car in proportion to the greater power necessary to haul it when compared to that necessary for a fully loaded car. It seems evident that the increase will be, or should be, different for almost every road. If the profile of the road is such as the D. & R. G., where the grade is up hill practically half the time and down hill the other half, tests on the Burlington (in 1895 and 1897) indicate that the actual weight of an empty car should be increased 7 per cent. in rating locomotives and figuring ton-mileage. On the Burlington, between Chicago and the Mississippi River, where the grades are comparatively light, and the speed relatively high, approximately 50 per cent. should be added to the weights of empty cars in order to get a proper credit for the work done in hauling them, compared with loaded cars. On the Burlington, in Iowa, west of Creston, where there are numerous grades, several more than 1 per cent., comparatively little level track and numerous curves, the credit for empty cars should be 7 per cent., as on the D. & R. G.

The effect of temperature, speed, and the gross weight of each car on the power required to haul a given tonnage, furnish additional proof that it is unwise to expect to make a fair comparison of the motive power records on two roads, except when all conditions on both are practically identical. A state rarely, if ever, found.

Passenger Service.

The claim has been made that it is better to have the motive power statistics for passenger service compiled on the mile, instead of ton-mile basis, because the Division Superintendent and the Master Mechanic have no control of the weight or speeds of these trains. These objections apply to freight service with almost equal force in so far as speed is concerned, and on a number of roads which handle considerable amounts of perishable freight, the weight of these trains, which is limited by the speed required, is controlled almost entirely by competitive considerations. It seems to me that the advantages to be obtained by the use of the ton-mile basis are the same for passenger as freight service, namely, that it furnishes a more nearly accurate measure of the work done than the mile basis, and the more accurate the credit for work performed the more intelligently can we reduce the debit of expense.

Switch and Work Train Service.

It is customary to credit switch and work engines with an arbitrary number of miles per hour of service, giving the same credit whether at work or standing still. This was done, no doubt, in order that they might have some credit against which to charge the debit of supplies, wages and repairs, and only as a rough approximation. It seems to me that, so far as work train engines are concerned, there is no difficulty in crediting them with the actual ton-mileage earned, and that this will give a much more nearly accurate measure of the work performed by them than any arbitrary number of miles for each hour they are in service. For switch engines I see no good reason why they cannot be credited with arbitrary ton-mileage, as well as mileage only, but believe that a simple plan can be developed by which they will be credited with ton-mileage which shall depend on the ton-mileage of the road engines entering the yard at which the switch engines work. In other words, the ton-mileage of the switch engines will be proportional to the ton-mileage of the road engines.

* Extracts from a paper by Mr. C. H. Quereau, read before the Western Railway Club, February, 1900.

Pusher Service and Doubleheading.

The credit for ton-mileage for pusher and doubleheading engines should be made on the basis of the proportional power of the engines attached to the train. This is quite easily determined by means of a table which can be made out in the drawing room, from the formula $T = \frac{d^2 ps}{D}$, in which T is the tractive power; d is the diameter of the cylinder; p is the boiler pressure; s is the stroke; and D is the outside diameter of the drivers; all the dimensions in inches and the pressure in pounds per square inch.

Grouping Ton-Mileage Statistics.

The element of speed has a decided influence on the amount of coal used per ton-mile. If it were practicable to include this in the basis for motive power statistics, it would add considerable to their accuracy. As this is impossible, it will add materially to the usefulness of the ton-mile statistics if the different classes of locomotive service are grouped by themselves; all the passenger, freight, helper, work and switch engine records being compiled, each in a group of its own. I also believe it is wise to separate the main line and branches, as the work on the branches is different from that on the main line, and controlled very largely by local conditions, both as to speed and the work done. Moreover, the branch engines are usually of more antiquated patterns than those on the main line.

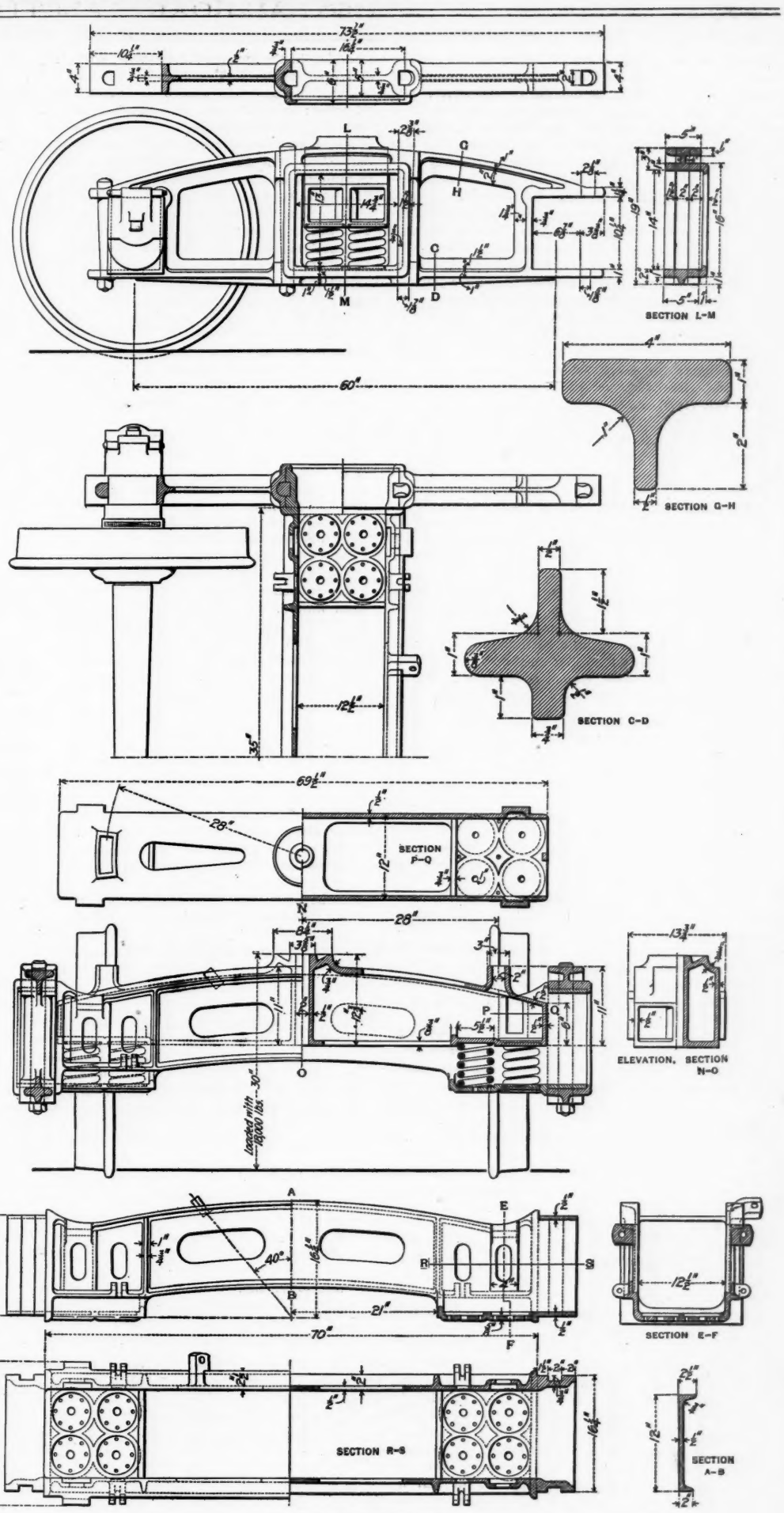
A Cast Steel Truck.

The engravings show a steel truck designed by Mr. W. E. Symons, Superintendent of Motive Power of the Plant System. A truck of this design has not yet been put into use, but a set of castings will shortly be made and fitted and a trial truck put in operation in order that defects of design may be discovered and taken care of.

The primary object in designing this truck was to get rid of the multitude of parts common to the standard built-up trucks, thus eliminating a great proportion of maintenance cost and failures. As the use of cast steel in locomotive building grew, the inventor conceived the idea of making a car truck to be cast all in one piece at one pouring. Such a truck, embodying all the desirable features of the open-jaw, arch bar type and without the disadvantages of the pedestal type, was worked out. That truck, however, was never cast, but Mr. Symons has completed the design shown now, for a three-member truck. This, it will be seen, is made up of the two side frames or arch bar members, which are interchangeable with each other and of the cross connecting member. This latter combines within itself transoms, sand plank, spring seats and improved guides to receive the bolster flanges and arrest the lateral thrust and shock of the truck bolster.

The three members are joined by devices embodying simplicity, durability and cheapness. If the nuts from the four column keys should work off through carelessness or accident, the keys will not come out, but will, it is claimed, work down by gravity, as will the four journal box keys, the eight tapered semi-circular keys being the only movable parts used in the construction.

If either member of the truck is damaged in a wreck it can be removed by taking out the two column keys when the new member can be substituted, and there is no work for blacksmiths and machinists.



The Symons Cast Steel Truck.

The Columbia University Engineering Laboratories.

Columbia University celebrated Washington's Birthday by opening for inspection to a large number of invited guests many of its buildings and all the laboratories. The apparatus and machinery was explained by attendants to the throngs that passed through the laboratories the entire afternoon.

Of particular interest was the big Baldwin compound "Columbia" in the Locomotive Section of the Mechanical Laboratories. For the first time since it has been mounted at the University, the engine was run, compressed air being used as the motive power; and the big 84-in. drivers turned at about a 20-mile gait. No regular instruction will be given the present school year in railroad engineering, but preparations for a regular course in the fourth year are being made by the department, of which Mr. E. L. Custer will be the assistant in charge under Professor Hutton. It will not be long before the necessary preparations are made to run the locomotive either by steam from its own boiler or by steam from the university power house. Before really valuable data can be obtained, a dynamometer must be bought, costing about $3,000, the money for which has not as yet been given. It is hoped that the simple announcement that this amount is required before many important tests can be made with the "Columbia," will lead to an immediate response from someone waiting for the opportunity to further the cause of railroad engineering in this country.

A standard trolley car, the gift of the J. G. Brill Company, equipped with electric motors, the gift of the General Electric Company, is near the "Columbia." When the trucks have been mounted similarly to the "Columbia" mounting, the motors will be run experimentally and tests will be made.

A number of other machines were on exhibition in the engineering laboratories, among which was the large experimental triple-expansion Corliss engine, the gift of the sons of Edward P. Allis. It can be run either as an ordinary power plant engine or driven as a three-stage air compressor with intercoolers, giving compressed air to 250 lbs. When run as an experimental steam engine, the steam used is condensed by the water in the depressed tank under the room, where it can be accurately weighed.

In an alcove north of this engine, is a Westinghouse air brake equipment with pump, valves, car reservoirs and train pipe complete, the gift of the Westinghouse Air Brake Company. In the Worthington section of the mechanical laboratories is the hydraulic machinery, the gift of Mr. C. C. Worthington as a memorial to his father, the late Henry R. Worthington. Water can be put under a pressure of 5,000 lbs. per square inch in the high pressure pump of this triple-expansion, duplex pumping engine. Gas engines, oil engines, dynamometers, condensers, etc., were also on exhibition.

Massachusetts Railroad Commissioners' Report.

The Railroad Commissioners of Massachusetts, James F. Jackson, George W. Bishop and Hersey B. Goodwin, have issued the 31st annual report of the Board. We have received advance sheets of the first part of the report. The length of railroad in the State is only one mile more than a year ago. The density of population and the diversity of the transportation industry in Massachusetts is indicated by the fact that there are 1,327 miles of side track to 2,109 miles of main line. The length of road operated by the roads reporting is 8,935 miles and

most of the statistics shown in the report are for the whole of this mileage, more than three-fourths of which, it will be seen, is outside of the State. Although it is impossible to consider these statistics from the point of view of territorial limits, some of them are, nevertheless, of interest as showing the course of traffic and earnings on four important railroads in the most thickly settled part of the country. For example, the average passenger train load is 62, as compared with 58 for the whole of New England, as reported by the Interstate Commerce Commission. This load, 62, is the smallest for 10 years, there having been a gradual decrease from 1890, when the average was 69. The average passenger journey is 17 miles, which has increased in 10 years from 15 miles. The number of passengers to and from Boston has fluctuated greatly, owing largely to the building of competing street car lines. Thus the number of passengers for seven years has been, in millions: (1893) 56.6, (1894) 52.8, (1895) 52.0, (1896) 53.5, (1897) 49.7, (1898) 49.0, (1899) 49.2.

The average freight train load is 182 tons, the averages for the past five years having been 148, 155, 160, 172 and 182. The average for New England for 1898 (I. C. Com.) was 160 tons. The average load on the Fitchburg road is now reported as 214 tons and on the Boston & Albany, 199. In density of traffic the Boston & Albany showed the best record, both in passengers and freight. The passenger mileage per mile of road for all the companies was 358,845; freight ton-miles, 671,577.

The average passenger fare of all the roads reporting in Massachusetts was 1.77 cents, which is a bare trifle less than the average for the last five years. The average freight rate is 1.18 cents; on the Boston & Albany it is 0.78; on the Fitchburg, 0.77; on the New York, New Haven & Hartford, 1.41, and on the Boston & Maine, 1.43. The rolling stock reported by all the roads was as follows:

	1899.	1898.
Locomotives	2,091	2,072
Passenger cars	3,144	3,174
Baggage cars, etc.	582	577
Freight cars	33,935	35,491
Gravel cars, etc.	1,937	1,890

The number of employes reported is 51,881. There has been a slight increase in the last three years, but in 1896 the total was 52,127. Ten passengers, 63 employes and 139 other persons were killed in Massachusetts during the year and 195 passengers, 527 employes and 138 other persons were injured. Estimating the total number of passengers carried in Massachusetts at 80 per cent. of the total number reported, the following ratios are shown: Passengers killed, by causes beyond their own control, one to 16,327,037; injured, one to 555,341; passengers killed by their own fault, one to 16,327,037; injured, one to 1,700,733.

The total amount expended in Massachusetss during the past 10 years for the abolition of grade crossings is $12,408,384. Of this the State has paid $3,541,364 and has received back from cities and towns, or will receive, $971,417, leaving the net charge against the State under the law of 1890, $2,479,947. These sums represent payments under the general law. To make up the grand total of 12½ millions there is included about 2½ millions expended on the Boston & Providence under special laws.

Prof. G. F. Swain, Bridge Engineer, has made the usual inspections of bridges. The length of wooden bridges in the State still exceeds by about 1,700 ft. the length of metal bridges. During the year 23 new bridges were built, 45 were rebuilt and 33 were strengthened.

Acting under a resolve passed by the Legislature a year ago, the Board has investigated suburban passenger fares and rates for carrying bicycles. The conclusions of this report have already been given in the Railroad Gazette. The Board found that it was inexpedient to order bicycles to be carried free, the rates in Massachusetts being very low, and also found that there was no serious and well-founded complaint of the present suburban passenger fares.

The Commissioners have investigated a number of train accidents which have happened in and near the new South Terminal station at Boston; and while it was found that these accidents (collisions) were due to failure to observe regulations, the Commissioners appear to think that with the complication of tracks and signals there should be a rigid limit on the speed of trains. The Terminal Company has refused to report accidents, for the reason that it is not a railroad company. As trains, while on its premises, are operated under the Terminal Company's rules, the Commissioners think that the laws governing railroads should be made to govern it.

The Railroads of the Dutch East Indies.

The Dutch possessions in the Indian Archipelago—Sumatra, Java, part of Borneo, etc.—have an area of about 800,000 square miles and a population of 70,000 Europeans, half a million Chinese and 31½ millions of natives. Many of the Europeans are in Government service. Most of the Chinese are tradesmen. The climate of the country is in general very damp.

The most important industries from a transportation point of view are coffee and tobacco raising and tin mining. To promote these industries railroad construction in the two most important islands has been active for some time past and is now being carried on with energy. The length of railroad in 1880 was 257 miles; in 1885 it was 582 miles and at the present time the number of miles in operation is 1,120. Also, steam tramways aggregating 352 miles are now in operation. The Java State Railroad is now engaged in building new lines aggregating 188 miles in length. This state road already operate 874 miles and has 237 locomotives, 493 passenger cars and 3,000 freight cars. The Sumatra state road has 131 miles of line, 60 locomotives, 65 passenger cars and 377 for freight. This island has a non-Government line 64 miles long called the Deli Maatschappij. This road has 14 locomotives. There is also here a small mountain rack railroad which was built entirely for industrial purposes. The length operated by cog wheel locomotives is 19 miles and about 25,000 tons of coal are carried over the line annually. The line was costly and there is a short tunnel on it, but the coal is carried at the rate of about eight mills per ton per kilometer. This average appears, however, to include carriage for some distance on ordinary track. The coal is carried in cars of the American style, of 20 tons capacity. The state railroads of Java and Sumatra are under the management of the Minister for the Colonies at The Hague. The local managers are, for Java, Mr. J. E. de Meyier, Batavia, and for Sumatra, Mr. T. F. A. Delprat, Pedang. There are several hundred miles of private owned railroads in Java.

The railroads of East and West Java have recently been united, so that one can now travel from one end of the island to the other in two days.

Most of the tramways are 3 ft. 6 in. gage.

The United States Consul at Batavia thinks that American railroad builders and dealers in railroad supplies ought to cultivate the field in that country. Many miles of tramways and electric roads have lately been built, and more are projected, but all of the contracts seem to have gone to Germany and Holland. The imports of rolling stock into the Dutch East Indies in 1898 amounted to nearly a million dollars, the most of which came from Holland, though by no means all of the goods bought from Holland were made in that country. Germany, Belgium and Great Britain appear to control the market for locomotives and nearly all railroad supplies. The demand for bridges exists all the year round, for disastrous floods are frequent. There are no discriminating duties against the United States, and there seems little doubt that the present flourishing conditions of business will continue.

TECHNICAL.

Manufacturing and Business.

The Grand Rapids Bridge Co., Grand Rapids, Mich., has been organized with a capital of $50,000 to do a general contracting business; furnishing labor and materials for construction, erection and repairing of all kinds of bridges and other work; also the designing, estimating and supervising for such work. M. J. Reiseger is President and General Manager, and F. L. Gaines, Vice-President and Superintendent of Construction.

The Weatherly Foundry & Machine Co., capital $10,000, was chartered at Harrisburg, Pa., last week. The Directors are: Elmer Warner, Wm. H. Koons, J. W. Lovatt, Fred Bertolette, Jas. G. Eddie, Jos. R. Cassler, Jas. S. Kressley.

Mr. J. V. Bell now represents the Chicago Pneumatic Tool Co. at Houston, Tex., where he is, and for a number of years has been, representative of the American Steel Foundry Co. of St. Louis.

Mr. George S. Fowler represents the Chicago Pneumatic Tool Co. in the Southeastern States, with headquarters at Washington, Hotel Raleigh. He continues to represent the Corning Brake Shoe Co., with which he has been connected for a considerable time.

William S. McGowan, Jr., has resigned as Treasurer of the Hancock Inspirator Co., of Boston, Mass., to become Treasurer and General Manager of the Portland Iron & Steel Co., of Portland, Me., a new company composed of a number of prominent New England manufacturers and capitalists. The plant of the Portland Rolling Mills, at South Portland, Me., has been bought and will be equipped with modern machinery and put in running order with the least possible delay. The rapid growth and success of the Hancock Inspirator Co. was due largely to the efforts of Mr. McGowan and when the company was absorbed recently by Manning, Maxwell & Moore, of New York City, he was retained in charge of the plant at Boston.

Russell D. Woodman, of the Westbrook Trust Co., Westbrook, Me., wants prices on first-class 60-lb. relaying rails.

The Western Railroad of France, gage 4 ft. 9 in., is in the market for 300 car wheels and a quantity of axles. M. Clerault, 44 Rue de Rome, Paris, is Engineer in Chief of the road.

The security car door, made by the National Railway Specialty Co., of Chicago, will be used on the 400 box cars to be built by the Illinois Central at its Burnside shops, and on 200 cars for the Seaboard Air Line, to be built by the South Baltimore Car Works.

The Powers Regulation Company, Chicago, has recently equipped the "Empire State Express" of the New York Central & Hudson River with its automatic apparatus for controlling the temperature in the cars. Two trains of the Boston & Albany, running between Boston and New York, have also been equipped.

Detroit lubricators, with Tippett attachments, made by the Detroit Lubricator Co., will be used on the 33 locomotives for the Erie; 15 for the Central of New Jersey; 16 for the Baltimore & Ohio; one for the Standard Oil Co.; one for the Tionesta Valley, and one for the David Wood Lumber Co., all recently ordered. The Boston & Albany is putting Tippett attachments on all its locomotives.

Mr. J. W. Duntley, President Chicago Pneumatic Tool Co., has been in Philadelphia lately conferring with officers of the Russian Navy, to close an order for over 1,000 pneumatic tools, amounting to about $300,000. The company states that the Russian Navy have adopted the Chicago Pneumatic Tool Co.'s tools exclusively. The officers inspected the tools in use at Cramp's Shipyard, Philadelphia, where there are over 300 of the Chicago Pneumatic Tool Co.'s hammers, riveters and drills in use. The order to be placed covers the new Boyer long-stroke hammer, deck and shell riveters, Boyer drills and hammers and a number of special tools.

Iron and Steel.

Among the principal additions and improvements under way by the Federal Steel Co. are a new cement plant and two new blast furnaces at the South Chicago Works; a coke plant of 1,200 ovens in Fayette County, Pa., including a terminal railroad to connect the plant with trunk lines. Additions are being made to the equipment of the several railroads, some second tracks are being put down. The Elgin, Joliet & Eastern Ry. is being extended from Griffin to Clark Junction, Ind.

Francis H. Saylor has resigned as Superintendent of the Pottstown Bridge Company, a position which he filled since the resumption of the works about a year ago.

Among the reported improvements under way by the Republic Iron & Steel Co. may be mentioned the following: Building one additional 20-ton open-hearth furnace and charging machine at the Minneapolis plant; at Birmingham, Ala., an additional blast furnace is being built; the Bessemer plant of the Union Steel Co. is being transferred to Youngstown, O.; transferring Belgian 14-in. roughing, and 9-in. finishing trains from Muscatine to Inland plant at East Chicago, Ind. An additional puddling mill is being built at the Inland plant.

The American Tin Plate Co. will dismantle the Neshannock works at New Castle, Pa., containing eight black plate mills. Six of the mills will be added to one of the western works, and the other two will be added to the Shenango works at New Castle.

The Virginia Iron, Coal & Coke Co. has work in progress on enlargements of furnaces and is building a number of new coke ovens. Several branch lines of railroads are also being built.

Stack No. 1, at Youngstown, O., plant of the National Steel Co., was put in operation during the night of Feb. 13. The furnace is 105 ft. high, 15 ft. crucible and 23 ft. bosh. The capacity of the furnace is 600 tons every 24 hours. Two other furnaces, of similar dimensions, are now building, and one of these will be completed in a short time.

The American Tin Plate Co. and the National Steel Co. have brought the entire office force from Chicago to New York City, and have opened offices in the Battery Park Bldg., New York.

The American Steel & Wire Co. are pushing work on rebuilding their wire mills at Waukegan, Ill., which were destroyed by fire in November. Most of the buildings are ready to receive the machinery. Among the other improvements and additions under way by this company are four open-hearth furnaces at Cleveland, O.; four open-hearth furnaces at Worcester; one blooming mill at Worcester; a blast furnace at Edith, Allegheny, Pa.; one blast furnace at Central, Cleveland; one blooming mill at Shoenberger plant; 230 coke ovens to be built in Westmoreland County, Pa.; also 1,000 coke ovens and one 5,000-ton per day plant in Fayette County, Pa. Work is being continued on the concentration of the plants of the Pittsburgh District on Neville Island.

Ground has been broken at the Colebrook furnaces on the western limits of Lebanon, Pa., for an iron ore roaster and gas producer, with a capacity of 750 tons of ore daily. The dimensions of the roaster which is being built for the Lackawanna Iron & Steel Co. will be about 110 x 275 ft., being 75 ft. high.

The Care of Car Journals.

At the January meeting of the Central Railway Club, Buffalo, Mr. H. C. McCarty read a paper on the Lubrication of Freight and Passenger Cars, il-

lustrated with diagrams and a model. We recently gave some extracts from this paper, but of course could not reproduce it adequately without engravings. We are now informed that the Club has had many applications for copies of this paper and that it is prepared to supply copies for distribution among railroad employees. In order that this may be done, however, the Secretary of the Club should be informed promptly of the number of copies required in order that he may have them printed while the matter is on the press. Orders cannot be accepted after March. 7. This paper, with its illustrations and with the discussion brought out, will be made up in a pamphlet separate from the regular printed proceedings of the Club. We are not told what the price will be. The Secretary to whom inquiries shoul be addressed is Mr. Harry D. Vought, 114 Fifth Ave., New York City.

Plugs for Cross Ties.

A Mr. Collet has patented a method of re-enforcing spike-worn cross ties by the use of screwed plugs, and this method is largely used on the Paris, Lyons & Mediterranean. That road uses a good many soft wood ties and the ordinary rail fastening is a screwed spike. Mr. Collet's method is to bore out the injured fiber, making a smooth hole. Into that he screws a hardwood plug, which is 53 millimeters diameter at the top and 35 millimeters at the foot. The pitch of the threads on this plug is 15 millimeters and the depth of thread five millimeters. When this is screwed in it is sawed off flush with the top of the tie, then the spike is screwed in in the way common on many European railroads. Of course a special kit of tools must be furnished to do all this work. The Paris, Lyons & Mediterranean began using this arrangement in 1898. Up to the time of reporting Mr. Collet had furnished nearly 3,000,000 of these plugs to this railroad company.

River Improvement Contracts.

The contract for building five miles of jetties at the mouth of St. Mary's River, Cumberland Sound, Fla., was let by Capt. McKinstrey, U. S. Engineer, on Feb. 17 to Christie, Lowe & Heyworth of Chicago, whose bid of $1,100,750 was the lowest submitted. The work will commence in about three months and will be completed in two years.

The same firm has received a contract to improve the Warrior River below Tuscaloosa, Ala., for $417,-000. Locks and dams are to be built to make the river 6 ft. deep the year round. The Warrior River empties into the Tombigbee and thence into Mobile Bay, and is the outlet of the coal fields of Georgia. This improvement is expected to materially reduce the price of coal at Mobile.

Loading Long Lumber.

Mr. P. Leeds, Superintendent of Machinery of the Louisville & Nashville, and Chairman of the M. C. B. Committee on Loading Long Lumber, asks that those having suggestions to make send him blue prints and a full copy of the present rules corrected to embody the desired changes.

Compound Locomotives.

The Committee of the Master Mechanics' Association has issued a circular of inquiry about compound locomotives, and if the final report covers all the points raised it will be a very interesting document. Information should be sent to the Chairman, Mr. J. F. Deems, Master Mechanic of the Chicago, Burlington & Quincy at West Burlington, Ia. The following are the principal questions:

How long have you had experience with compounds? Freight, passenger and switching.

How much do you estimate fuel economy per ton-mile or per trip (if car-mile basis is used give method of equalizing loads and empties), or what saving by compounds in switching service; or are they used in this service solely to diminish noise around large stations and not with a view of saving fuel?

In what service do compounds show greatest fuel economy, and is this item materially influenced by the gradients of the line, and if so, on what character of road may they be used to greatest advantage?

Are compounds as flexible or as readily adapted to various kinds of service as simple engines of the same class?

Is it your practice to use larger driving wheels on compounds than on simple engines in freight and passenger service?

If pooling of locomotives and crews is practiced, are compounds pooled or assigned to regular crews?

Is the train rating of compounds in freight service higher than simple engines of the same weight, class and steam pressure? Give percentage of increase, if any.

If such rating is higher, is it with the idea that the engines will be worked simple over maximum grades?

What do you consider the correct rate for diameter of cylinders for freight and passenger service?

Some compounds are built so that under ordinary service conditions the change from simple to compound is effected by automatic intercepting mechanism, while with others it can only be done manually. Which type do you prefer, and give reasons for preference?

Have you experienced any trouble from large cylinders drawing in smokebox gases, drying up lubrication, cutting valve seats, cylinders, etc.?

Is there less danger of setting out fires from the stack of compounds than simple engines?

Do you relieve cylinders while drifting down hills, into stations, yards, etc., and in what way?

Have you used slide or piston valves on compounds; if so, in what way and with what results; if experience with both, which do you prefer?

Do the compound and simple engines between which comparisons are made carry the same steam pressure; if not, please give difference?

To what extent are compounds worked simple?

Do not engineers work compounds simple to a much greater extent than instructions contemplate?

Are compounds out of service for repairs more than simple engines? Give comparative figures if possible.

Do you consider cost of maintenance of boilers less for compound than simple engines carrying same steam pressure? State approximately the difference.

Do you find cost of maintenance of machinery more; if so, about what percentage?

Do you find cost of lubrication more, and how much?

Might not the ratio between increased cost of maintenance and decreased cost of fuel consumption make the compound an economical or uneconomical machine as the cost of fuel is high or low in different localities?

What is the average cost of coal per ton where you are using compounds?

Is there any difference between the size of the exhaust nozzle of compound and simple engines of the same power, and in favor of which?

Have you made any careful dynamometer or indicator tests of compound engines? Please give extent of such tests and results obtained, showing comparisons with simple engines, if any were made.

There has been a great increase in size and power of simple engines recently. Is it practicable to build compounds of corresponding hauling capacity without encountering great difficulty from the pistons and cylinders at high-piston speeds?

What is the best material and designs for low-pressure pistons?

State in general terms what you consider the more important improvements that have been made in connection with compounds since their introduction, both as to construction and the assignment, handling or disposition of the engines in service.

In general terms, what would you designate as the weak or defective points, or those most in need of perfecting at present time on compound locomotives?

Have you converted any compounds to simple engines, and was the change made necessary by general undesirability of the compound feature or by special local conditions, and if the latter, give in a general way the conditions justifying the change?

A New Boiler Lagging.

Several of the European governments are experimenting with Amianthine mattrasses for lagging the boilers on war vessels as well as for locomotives, and the results so far have been very gratifying. The only obstacle to the extended use of the new article has been its price, which ranges higher than for any other materials heretofore used for insulating purposes, averaging in Western Europe from 30 to 45 cents per square foot of mattrass, according to thickness. The ease with which it can be applied and removed, however, compensates in a degree for the high first cost. The matrasses are manufactured in widths of either a meter or a half meter, and the general method of using them seems to be merely to wrap them around the boiler, after holes for pipes and fittings have been cut out; the mattrasses are then secured with coarse meshed netting of fine steel wire, after which the ordinary polished steel jacket is strapped on in the usual manner.

Amianthus is a mineral of the same class as asbestos, is blue in color, and exists in large surface deposits in the vicinity of the Orange River in South Africa. The trade is controlled by a French company located at Rochefort, France. The mattrasses are made of Amianthine felt, stuffed with fiber and sewn with yarn of the same material, which makes them practically fireproof, besides being proof against water and acids. There are understood to be deposits of white Amianthus in some portions of Canada.

New Harbor, N. S. Breakwater.

Tenders are called for by the Dominion Government for the construction of a breakwater at New Harbor in Guysboro County, N. S. Plans and specifications may be seen at the offices of E. G. Millidge, Resident Engineer, Antigonish, N. S., and at the Department of Public Works, Ottawa.

The Morse Iron Works & Drydock Co.

The Morse Iron Works & Drydock Co. of Brooklyn, N. Y., recently incorporated, has bought the waterfront holdings of the Atlantic Yacht Club, from Fifty-fifth to Fifty-seventh sts., Brooklyn, and, on April 15, will start work on building a drydock, which is to be the largest on the Atlantic Coast. The price paid for the property is said to be $300,000. The property fronts for 360 ft. in First Ave., and extends 700 ft. to the bulkhead. The riparian rights extend 1,480 ft. from the shore. The company has a capital of $550,000. It now has a shipyard at Twenty-sixth St., Brooklyn, and has done much work on Government transports there. E. B. Morse is President.

Bids for Naval Work.

Bids were opened at the Navy Department, Washington, D. C., Feb. 24, for a shipfitter's shop at the Norfolk Navy Yard, and for the construction of a pier at the Boston Navy Yard. The lowest bidders were the Penn Bridge Co. of Beaver Falls, Pa., at $94,616, and William J. Lawler, of Boston, Mass., at $24,800, respectively.

THE SCRAP HEAP.

Notes.

The United States Supreme Court, in a suit appealed by the Baltimore & Ohio Southwestern, has decided that the road was not responsible in damages for personal injuries to an express messenger in an accident, the messenger having signed an agreement relieving the road. It is declared that this agreement was not contrary to the public policy.

Statements are given out to the effect that the exact number of names entered on the pension rolls of the Pennsylvania Railroad during the first month of its existence was 998, and seven of these were dropped before the end of the month on account of the death of the members. The total annual amount of these 998 pensions is stated as "more than $200,-000." The employes relieved from active service represented all grades, there being eight officers, chief clerks and special agents, 183 laborers, 92 foremen, assistant foremen and other maintenance of way men, 228 watchmen, sweepers and shop helpers, 130 carpenters, painters and car builders, 100 agents, office clerks and station men, 93 blacksmiths and machinists, 91 enginemen and roundhouse men, and 73 trainmasters, conductors and train, yard and boat men; 718 of those retired were members of the Relief Fund, each of whom receives, in addition to the pension allowance from the company, a superannuation allowance from the relief department, the aggregate of which is more than $27,000 yearly.

Railroad Supplies for Siam.

Through the efforts of the American Minister, Mr. Hamilton King, and the Siam-American Trading Co., L. E. Bennett, Trustee, of Bangkok, the King has agreed to extend the time for receiving tenders for supplying rails, etc., for the new Petchaburi Ry., metre gage, to be built here, from Feb. 13 until such time as the American manufacturers can be heard from. Materials to be tendered for are as follows:

1. 8,739 tons of rails 8 metres long. Weight to equal 20.8 kilograms per metre, with shorter rails for 80 switches.
2. 187 tons of iron spikes. Weight 0.18 kilogram per piece.
3. 446 tons of steel fish plates. Weight 11 kilograms per pair.
4. 66 tons of bolts and nuts. Weight 0.39 kilogram per piece.
5. 22 tons of washers spring steel rings. Weight, 12.5 kilograms per thousand.
6. 164 tons of steel tie plates. Weight 1.03 kilogram per piece.

The supply must in every way correspond to the requirements and regulations of the American railroads. The tenders must be binding for three months and contain:

1. The price per ton of 1,000 kilograms for each kind of material f. o. b. at large sea-port.
2. Time of delivery f. o. b. after the receipt of the order by letter or telegram. Delivery may take place in installments, but then the time of delivery and quantity of each installment must be mentioned in the tender.
3. Conditions of payment in case those mentioned hereafter are not satisfactory. One-fifth of the amount on ordering three-fifths of the amount on shipment against delivery of the bill of lading, and one-fifth of the amount after arrival in Bangkok in satisfactory condition. The respective payments will be made in the case of American manufacturers through the Hong Kong & Shanghai Banking Corporation, of No. 50 Wall Street, New York City, by telegraph.

The Siam-American Trading Co. offer to act for American manufacturers in this case if a special commission agents' commission of one per cent. be included in the tender price. Their cablegrams should be immediately followed up by letters confirming the cablegram and enclosing detailed specifications of what will be supplied, together with price and time of delivery.

Minister King states that as Siam is on the eve of great things in the way of railroads, bridges, irrigation, etc., it will pay American manufacturers to make the prices and time of delivery such telling ones that there will be no doubt as to the contract being sent to America. A blue print showing the type of rails and fastenings required can be seen upon application at the Philadelphia Commercial Museum.

The Dewey Arch on a Bridge.

In the New York Tribune of Feb. 4 appeared a letter from Mr. Alfred P. Boller, accompanied by a drawing, suggesting that the Dewey arch be placed on a bridge at the crossing of the Harlem Ship Canal by the Riverside Drive. Mr. Boller reasons that this would be a magnificent site for a grand architectural display and that New York City has advanced far enough in civilization to justify doing something for the beauty of its bridges. He says, "A great theme deserves a great monument and a great monument is impracticable unless woven into a work of great public utility."

Compressed Air in Street Car Service.

The following is from the report of the engineer in charge of the compressed air motors—"Hardie type"—and their service during the snow storm in Chicago on February 4, 1900:

During the late blizzard in Chicago the Lake Street Elevated were compelled to abandon their service from 11 o'clock p. m. until daylight in consequence of the heavy fall of snow, and while the cable part of the line was kept reasonably clear of snow by the snow plow, we were compelled to keep the lower end of the line clear from the accumulating snow drifts by bucking the snow with the "air cars," and cleaning the tracks with the scrapers on the cars, and yet we made schedule time, and in one instance was compelled to push a horse car, drawn by four horses, which had been stalled on a curve. During the night we were called upon to assist in moving a large cable snow plow, which had been stalled around the curve from the Lincoln Avenue line, by attaching a rope to the car and to the snow plow, the car being backed until its power pulled the snow plow to its track at Clark Street, where it could again pick up its own cable. This was not a direct pull, as our car was on the other track. After performing this service the car was again pressed into service at the Limits barn, to push out the cable cars, enabling them to make up the cable trains, we pushing the cars through drifting snow, and also performing the work which was difficult for two horses and six men. This service was all performed during exceptionally bad weather, and during the zero weather of the previous week the compressed air motor service was absolutely reliable.

British Iron and Steel Prices.

The London Ironmonger for February 3 has the following statement of the advances made in unmarked iron bars in the Midlands since the fall of 1897, when the present boom in the British iron trade may be said to have begun, although there had been a good demand for British iron and steel products since the fall of 1895. The dates and the amounts of the various advances in unmarked bars since 1897 were as follows:

November 11, 1897, advanced to £6; July 14, 1898, advanced to £6 5s.; October 5, 1898, advanced to £6 10s.; January 6, 1899, advanced to £6 15s.; April 7, 1899, advanced to £7; June 2, 1899, advanced to £7 10s.; June 30, 1899, advanced to £8; July 14, 1899, advanced to £8 10s.; September 29, 1899, advanced to £9; November 9, 1899, advanced to £9 10s.; December 20, 1899, advanced to £10; January 25, 1900, advanced to £10 10s.

It will be seen that there have been no fewer than nine advances in unmarked bars within a little more than twelve months, and that as compared with January last year prices are now £3 15s. per ton higher. Never in the history of the

trade has such substantial progress been made in so short a period. In 1887 the quotation was as low as £4 12s. As had been generally expected would be the case, the "list" houses have followed the action of the unmarked-bar firms and have added another 10s. to their price, which has thus raised the official standard to £11 10s.

The Railroads and the Steel Makers.

We find in the New York Times of Feb. 20 the following letter from Mr. Fish, President Illinois Central Railroad:

The net profits in 1899 of a certain corporation engaged in the manufacture of steel and iron are said to have exceeded $21,000,000, and they are expected to reach $42,000,000 in the current year, 1900. Concerning that corporation Mr. Abram S. Hewitt is quoted in your issue of this morning as saying that it makes nearly one-half of the steel manufactured in this country.

Of the 13,620,703 tons of pig iron produced in the United States in 1899 it is safe to say that much more than 10,000,000 tons were manufactured into steel. As the corporation referred to makes both steel and iron, we may safely estimate its output at over 5,000,000 tons.

Of ore, fuel, flux, and the other supplies needed in and about the works, it takes fully three tons of material to produce one ton of finished product.

The average haul on all the railroads of the United States is 130 miles; that on the materials used in making iron and steel and on those products is doubtless longer. But with these figures we may estimate the railroad transportation done for that one corporation as follows:

	Tons.
Finished product of steel and iron	5,000,000
Materials of various kinds	15,000,000
Total	20,000,000

This, when hauled 130 miles, amounts to 2,600,000,000 ton-miles of railroad transportation.

A difference of one mill per ton-mile in the railroad freights paid thereon would amount to two million six hundred thousand dollars ($2,600,000) annually.

While there is no reason to suspect that the corporation referred to paid any lower rates than its competitors did, it occurs to me that its enormous profits, and those of the other iron masters, are, and have been, largely due to the railroads hauling freight for them, and for the public generally, below cost.

What else can account for the fact that in 1894 and 1895, while these gentlemen and the iron masters generally, were not only making handsome dividends, but rapidly re-equipping their plants with new and costly appliances, the railroads of the United States found it necessary to reduce the number of their employees from 873,602 to 779,608, say by over 10 per cent., and that of their cars available for freight service by 9,050; and why was it that on June 30, 1894, there were in the hands of receivers 40,818 miles of railroad, or nearly one-quarter of all in the United States (176,602)? These bankrupt railroads represented an investment of over $2,500,000,000.

Chicago & Alton Track Elevation.

The Chicago & Alton on Feb. 19 sent to the Chicago City Council its acceptance of the ordinance for elevating its tracks, which has been before the City Council in various shapes for about five years.

A Strenuous Railroad War in Chicago.

The latest railroad war with fists and clubs occurred in Chicago last week. On the evening of the 19th, 500 street railroad men forcibly contested with C. & W. I. men for the right to lay tracks on a crossing.

The Supreme Court of Illinois had dissolved the injunction secured two years ago by the steam roads restraining the General Electric Street Railroad from laying its tracks in Custom House Place, Plymouth Place and Fourteenth St. The Chicago & Western Indiana claimed that the laying of the street railroad tracks would greatly injure its business, and the case has been in the courts for over two years. The opinion just rendered holds that a street railroad cannot acquire exclusive right in a street, nor can a municipality give a steam road such exclusive right, but that streets are for ordinary passage and travel, to which all individuals are entitled, and that no exclusive right can be granted. Under this decision the General Electric at once began laying its tracks across those of the Chicago & Western Indiana at Fourteenth St., which led to the clash with the employees of the latter. Several cars were derailed on the crossing by the steam road. It is said that a dozen men were severely injured.

The Supreme Court has granted a stay of execution, so that there will be no further action until the April term of the Court.

Drainage Canal Water Power.

The Chicago City Council on Feb. 19 passed an ordinance authorizing an issue of $2,500,000 4 per cent. bonds, the money to be used to build a plant to develop the water power of the Drainage Canal under the proposed contract with the Sanitary District previously described. By the terms of this contract the city is to pay $4 a horse power a year at the wheel. It is expected that before bankers will take these bonds the question as to the right of the city to issue more bonds will have to be decided by the courts.

Lake Notes.

At the Lorain yards of the American Shipbuilding Co. on Feb. 24, the steel steamer J. J. Hill, built for the American Steamship Co., was launched. The Hill is 500 ft. long and a duplicate of the steamer John W. Gates, launched on Jan. 20, and noted in our issue of Jan. 26.

Before the River and Harbor Committee of the House recently, Col. Lydecker, U. S. Engineers, explained the congested condition of the Sault Ste. Marie Canal, where two or three blockades last summer caused a loss to lake shipping estimated at $1,000,000. He favored improving and deepening one of the shallow connecting channels for temporary use until a new lock can be built.

The car ferry steamer Muskegon, which runs between Milwaukee and the terminus of the Grand Rapids & Indiana at Muskegon, Mich., ran into Racine, Wis., on Feb. 24 with her steering gear disabled and one smokestack wrecked. She left Muskegon the night of Feb. 23 with 25 loaded freight cars and was struck by a gale of wind early on the 24th. The high seas and intense cold made the boat hard to handle. Some of the cars broke loose and two cars loaded with threshing machines collided and were wrecked.

Technical Schools.

Mass. Inst. of Tech.—On March 6 Mr. H. G. Prout, Editor of the Railroad Gazette, will deliver a lecture at the Massachusetts Institute of Technology on "The Engineer and the Railroads."

Worcester Polytechnic Institute.—The catalogue of the Institute dated 1900 contains an outline of the course of instruction, equipment of the laboratories and the special aims of each course. It also gives a register of every graduate, showing the occupation and place of residence of each. A number of changes have been made in the faculty. Prof. Albert Kingsbury has been appointed Professor of Applied Mechanics. Prof. F. R. Jones now has charge of the Department of Drawing and Machine Design, and Prof. A. Wilmer Duff is directing the work in physics.

Traffic Notes.

To avoid complications incident to commission paying the railroads centering in Chicago have agreed, it is said, to appoint an agent, at a salary of $2,000 a year, to take charge of the sale of railroad tickets in the hotels of the city.

Rumors of violations of the agreement not to pay ticket commissions are constantly in circulation at Chicago, but careful inquiries are said to have resulted in an entire failure to find evidence of cutting, and it is believed that the brokers are manufacturing the stories of violations.

It is announced that a revised edition of the Trunk Line official freight classification will be issued about March 10 containing the changes which have been made in consequence of the complaints made by shippers, at New York and elsewhere, concerning the advances made in numerous rates on January 1. It is said that on important commodities the L. C. L. rates will be made smaller so as to be more nearly equal to C. L. rates on the same; and the clause requiring an increase in the rate on drygoods, etc., packed in fragile boxes, will provide for a difference of 10 per cent., instead of a larger difference, as heretofore.

Through eastbound shipments of flour, grain and provisions from Chicago for the week ending Feb. 15 amounted to 212,312 tons, being an increase of 57,506 tons above the preceding week and about 50,000 over the largest week on record, which was in March, 1898, during the great wheat movement. Cutting of grain rates east from Chicago continues and rates (secret) mentioned by reporters have continued to grow smaller. It is said that some contracts have been made to extend beyond the opening of navigation. Large shipments are reported as having been taken to New York at 11 cents, and even lower, and a rate of 10 cents per 100 lbs. on grain has been reported from St. Louis to New York. Grain rates have been reduced three cents per 100 lbs. from the Ohio River to the Southeastern States. It is announced that the railroads carrying grain from Buffalo to New York are making contracts for ex-lake gain the coming season at three cents a bushel, which is half a cent lower than the lowest open rate ever made before.

The Bureau of Freight and Transportation, at Savannah, Ga., which has been in existence five years, has been discontinued. The Commissioner of the Bureau was Capt. D. G. Purse. The subscribers to the fund supporting the Bureau passed a complimentary resolution thanking Capt. Purse for his faithfulness and energy in managing the Bureau.,

Hon. J. G. Wallace, one of the railroad commissioners of Arkansas, issues a statement defending the Commission against misrepresentations which he says have been persistently made. He says that the Commission has watched the railroads closely, and that favored shippers have had their rebates cut off. The Commission reduced rates on cotton so that shippers saved an average of 25 cents a bale. Independent cotton-oil-mill men say that the Commission's cotton seed tariff has been of great value to them. The Commission's tariff on wood has enabled owners of timber land to clear off their tracts and sell the wood for enough to pay for the labor, whereas formerly such wood had to be thrown away. The Commission has made an entire revision of the freight rates of the State and will soon print a new tariff based strictly on distances. Mr. Wallace says that railroads enforce the distance tariff against small places, but that to or from, and sometimes both to and from, disributing centers, they make lower rates, thus favoring the large towns.

LOCOMOTIVE BUILDING.

The McCloud River is having one locomotive built by the Baldwin Locomotive Works.

The Kansas City, Pittsburgh & Gulf has ordered 10 locomotives from the Baldwin Locomotive Works.

The Standard Oil Co. four-wheel switching engine ordered from the Brooks Locomotive Works and referred to last week will weigh 78,000 lbs. and have 17 in. x 24 in. cylinders, 50 in. driving wheels and a tank capacity for 2,500 gals. of water.

The Tionesta Valley narrow gage mogul engine ordered from the Brooks Locomotive Works, as stated last week, will weigh 57,000 lbs., with 50,000 lbs. on the driving wheels, and have 15 in. x 18 in. cylinders, 38 in. driving wheels and a tender capacity for 2,000 gals. of water.

The Suwannee & San Pedro wants one standard gage engine with cylinders about 16 in. x 24 in. and driving wheels 56 in. in diam., and equipped to burn either wood or coal. Possibly a second-hand engine of this description would answer. Address the Drew Lumber Co., contractors, Columbia, Fla.

The Baltimore & Ohio has ordered from the Baldwin Locomotive Works 100 more compound consolidation engines like the 65 now building. These are to be built when the 65 are finished, all the engines to be delivered by Oct. 1. Another 100 engines are wanted, but nothing has been decided as to when they will be ordered.

The International & Great Northern order with the Rogers Locomotive Co., referred to last week, calls for three 10-wheel engines to weigh 166,000 lbs., with 130,000 lbs. on the driving wheels, and to have 20 in x 28 in. cylinders; 62 in. driving wheels; extended wagon top boilers with 315 iron tubes 2 in. in diam. and a working steam pressure of 200 lbs.; fireboxes, steel, 120 in. long and 42 in. wide, and a tank capacity for 4,000 gals. of water. The special equipment will include Westinghouse brakes, steel axles, metal brake beams, automatic M. C. B. couplers, electric headlights, Ohio injectors, metallic piston and valve rod packings, Coale muffled safety valves, air sanding devices and No. 9 sight feed lubricators.

The St. Louis Southwestern order with the Rogers Locomotive Co., referred to last week, calls for seven eight-wheel (American type) engines to weigh 117,000 lbs., with 80,000 lbs. on the driving wheels and to have 18 in. x 26 in. cylinders; 68 in. driving wheels; extended wagon top boilers with 275 iron tubes 2 in. in diam. and a working steam pressure of 200 lbs.; fireboxes, steel, 108 in. long and 33 in. wide, and a tender capacity for 4,500 gals. of water and eight tons of coal. The specifications include Westinghouse brakes, steel axles for driving wheels (the other axles to be of iron), Gollmar bell ringers, metal brake beams, automatic couplers, electric headlights, Monitor injectors, metallic piston and valve rod packings, 3 in. safety valves, air sanding devices, No. 9 sight feed lubricators and Safety system of steam heat.

The Texas & Pacific order with the Rogers Locomotive Co., referred to last week, calls for three 10-wheel passenger and seven 10-wheel freight engines. The former will weigh 156,000 lbs. with 115,000 lbs. on the driving wheels, and have 19 in. x 26 in. cylinders; 67 in. driving wheels; extended wagon top boilers, with 285 iron tubes 2 in. in diam. and a working steam pressure of 190 lbs.; fireboxes, steel, 126 in. long and 42 in. wide and a tender capacity for 4,500 gals. of water and six tons of coal. The freight engines will weigh 156,000 lbs., with 122,000 lbs. on the driving wheels and have 20 in. x 26 in. cylinders; 63 in. driving wheels; extended wagon top boilers, with 280 iron tubes 2 in. in diam. and a working steam pressure of 200 lbs.; fireboxes, steel, 123 in. long and 33 in. wide and a tender capacity for 5,000 gals. of water and nine tons of coal. The specifications for both types call for Westinghouse brakes, steel driving and iron truck and tender axles, Gollmar bell ringers, metal brake beams, automatic couplers, electric headlights, Monitor injectors, metallic piston and valve rod packings, air sanding devices, No. 9 lubricators and Latrobe driving, truck and tender wheel tires. The passenger engines will have Richardson safety valves and the Safety system of steam heat.

The Pittsburgh, Bessemer & Lake Erie locomotives noted last week are all to be delivered in April next. The one simple consolidation locomotive ordered from the Baldwin Locomotive Works will weigh, in working order, 170,000 lbs., with 152,000 lbs. on the drivers, and have 54 in. driving wheels. The boiler will be of the straight top type with a working steam pressure of 180 lbs., and 260 iron tubes, 2¼ in. in diam. and 14 ft. 9½ in. long. The firebox will be 115⅝ in. x 41 in., of homogeneous cast steel. The tank capacity for water will be 5,000 gals. The axles will be three per cent. nickel steel, and Standard driving wheel tires, Paige truck wheels and chilled tender wheels will be used. The two simple consolidation locomotives ordered from the Pittsburgh Locomotive & Car Works for use on hills will have drivers 54 in. in diameter, and will weigh 240,000 lbs., with 216,000 lbs. on the drivers. These engines will have straight top boilers with working steam pressure of 210 lbs. and 355 charcoal iron tubes 2¼ in. diam. and 15 ft. long. The fireboxes will be of Carnegie steel, 120 in. x 40 in., and the tender capacity 6,000 gals. of water and eight tons of coal. National hollow brake beams, Ohio injectors, Dressel headlights and chilled plate 33 in. tender wheels will be used. The two simple six-wheel switching locomotives ordered from the Brooks Locomotive Works will have cylinders 19 in. x 26 in., driving wheels 50 in. diam., and will weigh 122,000 lbs. The boilers will be of the straight top type with working steam pressure of 180 lbs., 272 lap-welded charcoal iron tubes 2 in. diam. and 11 ft. 7¼ in. long. The fireboxes will be of hammered steel, 108 in. x 42 in. and the tank capacity for water 4,000 gals. Hammered steel axles, Ohio injectors, Leach sanding devices, Nacherigg lubricators and Latrobe tires will be used. In addition to the specifications above noted all these locomotives will be equipped with Westinghouse brakes, Tower couplers, U. S. metallic piston and valve rod packings, Ashton valves and French springs.

CAR BUILDING.

The Maine Central is having one car built by the Pullman Co.

The Mexican Government is having two cars built by the Pullman Co.

The Baltimore & Ohio is in the market for 200 Rodger ballast cars.

The Arizona & New Mexico is considering ordering about 24 freight cars.

The Pittsburgh & Lake Erie has ordered 150 steel cars from the Pressed Steel Car Co.

The Southern Missouri & Arkansas has ordered three cars from the Mt. Vernon Car Mfg. Co.

The Wabash order for cars, referred to in previous issues, has been delayed for about 10 days.

The Issaquah Coal Co., Seattle, Wash., is considering ordering a few coal cars of 80,000 lbs. capacity.

The Southern Pacific is reported as negotiating for additional box cars. We have no official information.

The Coahuila & Pacific has ordered two caboose, four box and 50 flat cars from the American Car & Foundry Co.

The Chicago, Burlington & Quincy has ordered from the Jackson & Sharp Co. the six chair cars referred to last week.

The Vandalia order with the American Car & Foundry Co. referred to last week calls for 360 instead of 300 coal cars.

The Colorado & Southern order with the American Car & Foundry Co. referred to Jan. 26 calls for 50 stock and 287 coal cars.

The Wheeling & Lake Erie is said to be considering additional orders for rolling stock to be placed within the next six months.

The American Steel & Wire Co. has issued specifications for 1,000 wooden gondola cars of 80,000 lbs. capacity, referred to last week.

The Philadelphia & Reading on Feb. 27 increased its order with the Pressed Steel Car Co. from 500 to 550 wooden box cars, with steel underframes.

The Chicago & Alton, we are officially informed, is ordering from time to time a few cars for passenger service, but has placed no large orders.

BRIDGE BUILDING.

ANNAPOLIS, MD.—A bill is before the Legislature to authorize the Commissioners of Anne Arundel County to build a new drawbridge in place of the Long Cove bridge.

BALTIMORE, MD.—A plate girder bridge will be built over Susquehanna Ave., in Towson, Md., in connection with the plans of the Baltimore & Lehigh, to broad-gage the road.

BOSTON, MASS.—The contract for widening the draw opening of the Chelsea Bridge, between Chelsea and Charlestown, has been let to William G. Lawler, whose bid was $21,471. The other bidders were: W. H. Ellis & Co., $21,839; Ross & Fuller, $22,960; William J. Miller & Co., $22,539; Augustus Bellevue & Co., $23,062; George Hayes & Co., $22,900.

The draw is to be widened from 45 ft. to 60 ft. 2 in., and the contractor must make the necessary changes of the piers, wharves, etc., and main bridge, so that it shall fit the draw after it is lengthened 15.4 in. on the Chelsea side, and 10½ in. on the Charlestown end, and also rebuild two draw piers.

CHARLOTTETOWN, P. E. I.—It is reported that Dominion Government will be asked to vote $400,000 toward building a bridge over the Hillsboro River, near this place.

CHARLOTTEVILLE, VA.—A bill is before the State Legislature to authorize the Board of Supervisors of Albemarle County to issue bonds for building bridges.

CINCINNATI, O.—The Board of U. S. Engineers which is to consider the features of the bill now pending in Congress for new bridges over the Ohio and Mississippi rivers, is holding sessions in Cincinnati, O.

CLEVELAND, O.—The Cleveland Electric Ry. Co. has let the contract for the bridge and trestle on Hayden Ave., mentioned in this column Feb. 16. The entire improvement will cost about $20,000.

COHOES, N. Y.—A company has been formed and will soon make application for incorporation, with a capital of $35,000, to build a bridge across the Mohawk River at Vischer's Ferry.

COLUMBUS, O.—Sealed proposals will be received at the County Auditor's office, Columbus, Franklin County, Ohio, until March 20, for the substructure and superstructure of the following bridges:

Bridge over run on the Amity pike, Prairie Township.

Bridge over run at Watts Farm, Jackson Township.

Bridge over run at Holton Farm, Jackson Township.

Bridge at the Daugherty Farm, Prairie Township.

The Gahanna bridge over Big Walunt Creek, Mifflin Township.

Paving of the Gahanna bridge over Big Walunt Creek, Mifflin Township. W. H. Halliday, County Auditor and Clerk of Board of County Commissioners.

Franklin County will sell bonds on March 12, $120,000 of which are emergency bridge notes, and $25,000 for the proposed Goodale St. bridge. W. H. Halliday, County Auditor.

DES MOINES, IA.—Of the bids, with designs, received Feb. 14 for building a bridge over the Des Moines River at North Sixth Ave., the following were the lowest: Steel bridge, Variety Iron Works, Cleveland, O., $66,200; Malan arch bridge, J. H. Killmar, Des Moines, $76,000; Geisel concrete bridge, Geisel Construction Co., St. Louis, $78,130; Thatcher concrete plan, Capital City Brick & Tile Co., $69,867; Melber 300-ft. steel and concrete arch, John Killmar, Des Moines, $83,000; all brick bridge, Edwin Thatcher, designer, Paterson, N. J.; Capital City Brick & Tile Co., $82,975. Bids were also received as follows for abutments for the bridge to cross the Des Moines River on South East Sixth St.: Magden & Scheley, concrete work, $9,539; brick abutments, $12,152; J. B. Lock, stone work, $16,159.

DUBUQUE, IA.—The bridge proposed across the Mississippi River at Eagle Point, Dubuque County, will be an iron highway bridge about 1,300 ft. long. It will be built by the Dubuque & Wisconsin Bridge Co. T. H. Brede is Treasurer. The plans are being made and bids will probably soon be wanted.

EASTPORT, ME.—It is stated that the Washington County RR. will probably build a drawbridge between Carlow's Island and Governor's Island. A bridge near this point is 700 ft. long.

EASTVILLE, VA.—A bill has been passed by the Virginia House to authorize a bridge across Little Hog Island Creek, in Northampton County.

FLEMINGTON, N. J.—It is stated that a new bridge will be built over the south branch of the Raritan River at Rockafellow's Mills. It will be about 135 ft. long. The present bridge is of wood.

FORT MILL, S. C.—A bridge of three spans, each 115 ft. long, is proposed by the county. T. G. Culp, County Surveyor.

GRAND ISLAND, NEB.—County Clerk Carl H. Menck wants bids until March 21 for an undertruss combination bridge across the Platte River, six miles south of the village of Wood River, to be 360 ft. long, consisting of 10 spans of 32 ft. each and one span of 40 ft. Roadway 12 ft. Arnold C. Koenig, County Surveyor.

GUELPH, ONT.—The Guelph Junction Ry. will need one bridge on a proposed extension.

GUERNSEY, NEB.—The Chicago, Burlington & Quincy, according to report, will build a steel bridge over the Platte River near this place.

KANSAS CITY, KAN.—The Missouri Pacific Ry. Co. has a franchise before the city authorities for permission to build a steel bridge over the Kaw River to connect the Cypress yards with the freight yards on the east side of the Kaw, to relieve the present bridge at this point, which is used jointly by the Missouri Pacific and the Union Pacific railroads.

LA MOURE, N. D.—Bids will be received by the County Auditor April 3, for two combination bridges to be built on tubular steel piles. Both are to cross the James River. A. J. Alister, County Auditor.

MALDEN, MASS.—The bridge between Somerville and Wellington, we are told, will be rebuilt in the year 1901, provided a charter can be obtained from the Legislature for that purpose.

MILO, ME.—A bridge across Pleasant River collapsed on Feb. 17. It is stated that a new bridge will shortly be built.

MOLESWORTH, ONT.—S. E. Smith, Road Commissioner, invites tenders for a truss bridge to replace the Edwardsville bridge. Plans at Standard office, Listowel.

MONTESANO, WASH.—The Chehalis County Commissioners have been petitioned for a bridge over the Humptulips River.

NEWPORT, KY.—The Directors of the South Covington & Cincinnati St. Ry. Co. have recommended a viaduct across Taylor Mill Bottoms to secure a shorter route to Bellevue and Dayton.

NIAGARA FALLS, N. Y.—The Niagara Reservation Commission was recently before the Assembly Ways and Means Committee for an appropriation of from $125,000 to $200,000 to build new bridges on the Reservation.

NORFOLK, VA.—A bill is before the Legislature to incorporate the Norfolk Bridge Co., with a capital of not less than $100,000. The promoters are W. W. Tunis, T. H. Synon, E. B. Freeman, Edward R. Baird, Jr., and W. B. Hardy. It is proposed to build a bridge over the East Branch of the Elizabeth River from Lovitt Ave., Norfolk. This is a second project for a bridge over the Elizabeth River.

PITTSBURGH, PA.—A contract has been let to the Schultz Bridge & Iron Co. at $200,000 by the Highland Park Bridge Co. for a bridge from Butler St. extension, at the north end of the Haights Run bridge, crossing the Allegheny Valley RR. overhead and spanning the Allegheny River. It is a cantilever bridge 850 ft. long. It will have three deck spans of 200 ft. each, two 100-ft. deck spans and a 150-ft. trestle. The bridge will have a 20-ft. roadway, with tracks for electric cars, and room outside of the tracks for other vehicles.

Director of Public Works E. M. Bigelow has taken steps to have the proposed bridge built at Wilmot St. over Junction Hollow. The bridge will cost between $125,000 and $150,000. The plans have been made.

RANKIN, PA.—The Monongahela Street Ry. Co. is said to have let a contract to the Pittsburgh Bridge Co. for an additional approach to its bridge at Rankin, which will cost $30,000. The bridge will be of steel, about 600 ft. long and cross the Baltimore & Ohio tracks.

RATHDRUM, IDA.—Bids will be received until April 9 by the County Commissioners for a bridge across Pack River in Kootenai County. Jno. C. Callahan, County Clerk.

ROCKFORD, ILL.—The bridge proposed across the Rock River north of the city of Rockford will be of five spans, each 100 ft. long, and cost about $35,000. Daniel W. Mead, First National Bank Bldg., Chicago, Ill., is the Engineer.

ST. BONIFACE, MAN.—Councillor H. Lavoie will introduce a by-law in the Council to provide for a bridge across the Red River between Winnipeg and St. Boniface.

ST. CHARLES, MO.—A new highway bridge is proposed over the Missouri River at this place. Surveys are being made.

SAN ANTONIO, TEX.—Bids are wanted on April 2 for a steel girder bridge 100 ft. long across San Pedro Creek. M. Hicks, Mayor.

SOUTH OMAHA, NEB.—The Union Stock Yards Co. will build the proposed bridge at O St. It will be of four spans of various lengths and cost about $50,000. W. S. King is the designing engineer.

TERRE HAUTE, IND.—The Big Four bridge across the Wabash River, which recently collapsed, is mentioned in another column of this paper.

TORONTO, ONT.—The matter of a bridge over the railroad tracks at the foot of Yonge St. is before the City Council. Plans and specifications have been made which provide for a structure 32 ft. wide, with a 20-ft. roadway, at a cost of $55,000. C. H. Rust, City Engineer.

UTICA, N. Y.—Mayor Sherman and officers of the New York Central are considering the abolition of grade crossings.

WICHITA, KAN.—Reports state that locations have been decided upon for street railroad bridges in Riverside Park.

Other Structures.

ALBANY, N. Y.—Three buildings of the Troy Malleable Iron Works were destroyed by fire Feb. 24, causing a damage of $150,000. The plant is in the town of Colonie, five miles north of Albany and east of the Erie Canal. It consisted of seven brick buildings, valued at about $500,000. About 1,000 men are thrown out of work.

BALTIMORE, MD.—The Baltimore & Ohio is building at Curtis Bay a pier 800 ft. long and 70 ft. wide, which, when completed, will afford facilities for loading eight vessels with coal at one time. There will be four tracks on the pier.

CHESTER, PA.—Fire destroyed the Johnston Railway Frog & Switch Works Feb. 24, causing a loss of $35,000. The machine and blacksmith shops and rail cutting departments were destroyed.

COLUMBIA, S. C.—The Columbia Union Station Co. has been chartered to build the proposed Union Depot, in Columbia. J. R. Kleny, J. T. Barron, P. I. Wells and B. L. Abney are the incorporators. The capital is to be $100,000.

DALLAS, TEX.—The Texas & Pacific is considering building car shops at Marshall, Tex., during the coming year, but the matter will not be fully decided for 30 days yet.

DENVER, COLO.—The new shops of the Colorado & Southern Ry. at Denver, Colo., will front on what is known as Seventh Street. The approximate cost of the buildings will be $250,000, and the machinery will cost $100,000. The roofs of the buildings are all of structural steel. The only structural steel supports are the supports of the traveling crane; otherwise the walls are all brick with stone foundations. Plans are now complete for the round house machine and boiler shops, car shop, and mill, and bids will be received March 1. Work has been begun by the company on the excavation for the foundations. The buildings are as follows: The machine shop, which includes the blacksmith shop and boiler shop, under one roof, will be 125 ft. x 324 ft. This shop is really under two roofs; one over the crane and engine pits, and one over the machine shop proper. The one over the crane and engine pits has a span of 65 ft., and the other span is 60 ft. The portion carrying the crane will be higher than that containing the machine shop. The machine shop contains eight engine pits, one through pit, and the boiler shop contains three pits. The crane will have a span of 65 ft. and a 50-ton capacity. The car shop will be a two-story building, 110 ft. x 260 ft. The saw mill will be 80 ft. x 244 ft. The paint shop will be 48 ft. x 160 ft., built with a temporary end, and intended for a future extension of 100 ft. The office and store house will be one continuous building, the office portion being two stories, 48 ft. x 48 ft., and the store room one story, 48 ft. x 102 ft. The round house contains 35 stalls, with provision for a future extension of 15 stalls. The walls will be 24 ft. high; building 80 ft. in depth, with a 64-ft. through-girder turntable. The oil house is 24 ft. x 60 ft. The tool room will be built as an addition to the machine shop, 25 ft. x 44 ft., one story in height. The engine house will be 40 ft. x 60 ft. It has not yet been decided, however, on the engines to be used. The shops will be run by electric power from two dynamos, one 300 h. p. and one of 200 h. p. The transfer table will be 70 ft. long, with a travel of 550 ft. The shop yards proper will contain six miles of tracks. Coal chutes, cinder pits and sand house will probably be handled with a link-belt system. The shops are to be finished by Oct. 1.

DETROIT, MICH.—The Detroit Steel & Spring Works at Michigan Ave. and Bay City Ry. crossing were destroyed by fire Feb. 24, entailing a loss of $100,000.

HARRISBURG, PA.—Reports state that the Northern Central Ry. will build a new freight and passenger station.

HAWKSTONE, ONT.—Tenders are wanted for a wharf on Lake Simcoe, Ont., at Hawkstone, Simcoe County. Plans and specifications may be seen at the office of H. A. Gray, Engineer in Charge, of Ontario Harbor & River Works, Toronto.

JACKSONVILLE, ILL.—The Jacksonville Bridge & Machine Co., which was established at this place four years ago, was recently incorporated in Illinois, as the Illinois Bridge & Machine Co., with a capital of $20,000. It is proposed to build extensions to the shops which are in Jacksonville. C. R. Slaughter, Secretary and Treasurer.

MASSILLON, O.—The Russell Engine Co., incorporated several months ago, has plans ready for the new buildings for the plant. J. W. McClymond is President.

OAKLAND, CAL.—The plans for the new round house and machine shops for the Southern Pacific Co., to be built at West Oakland, are about completed.

OSWEGO, N. Y.—The Delaware, Lackawanna & Western will build a new 10-stall round house at Oswego at a cost of not less than $10,000. The work will be begun as soon as the frost is out of the ground.

The National Railway Spring Co. proposes to build a new mill at this place, but no plans have been decided upon as yet.

PITTSBURGH, PA.—F. R. Dravo & Co., of Pittsburgh, have the contract for building the water works on Neville Island for the American Steel & Wire Co. The contract calls for a tunnel 800 ft. long, from the Ohio River, and drilling four wells.

The Pittsburgh & Lake Erie RR. has let a contract to Stratton, Lewis & Co. for the foundations and smokestacks for the new power house, to furnish the power for the new station building. The power house will be located on Smithfield St., opposite the station, and will be connected by a tunnel, also to be built by Stratton, Lewis & Co.

SCHENECTADY, N. Y.—The freight office occupied by the Fitchburg and the West Shore railroads as a joint freight office at Rotterdam, was burned Feb. 27.

STOCKTON, CAL.—The Santa Fe will soon build a freight depot on Taylor St., extending from Eldorado to Center.

MEETINGS AND ANNOUNCEMENTS.

(For dates of conventions and regular meetings of railroad associations and engineering societies see advertising page xii.)

American Institute of Electrical Engineers.

The 140th meeting was held at 12 West 31st St., New York, and also at 228 South Clark St., Chicago, on Wednesday evening of this week. Dr. M. I. Pupin presented a short paper on the "Farad-meter." The paper of the evening was presented by Mr. Edward C. Boynton, entitled "Notes on Electric Traction Under Steam Railway Conditions." Applications have been received from 14 candidates for associate membership.

Western Railway Club.

At the April meeting of the Western Railway Club the revision of the Interchange Rules will be discussed, and a committee has been appointed to make a report at that time. This committee consists of Messrs. R. D. Smith, Chicago, Burlington & Quincy; P. H. Peck, Chicago & Western Indiana; C. H. Mileham; J. Buker, Illinois Central, and J. J. Hennessey, Chicago, Milwaukee & St. Paul. Those having changes to propose should correspond with the Chairman, Mr. R. D. Smith.

Central Railway Club.

The officers elected at the January meeting for 1900 are: President. H. F. Ball, Mechanical Engineer, L. S. & M. S. RR., Cleveland, O.; Vice-President, George W. West, Superintendent of Motive Power, N. Y., O. & W. RR., Middletown, N. Y.; Secretary-Treasurer, Harry D. Vought, 114 Fifth Avenue, New York; 384 Ellicott Square, Buffalo, N. Y.; Executive Committee: H. F. Ball, George W. West, E. A. Miller, Master Mechanic, N. Y., C. & St. L. RR., Conneaut, O.; H. C. McCarthy, Williamsport, Pa.; James Macbeth, Master Car Builder, N. Y. C. & H. R. RR., Buffalo, N. Y.; J. R. Petrie, Joint Inspector, Buffalo, N. Y.

The Engineers' Club of Philadelphia.

A business meeting of the Club will be held on Saturday, March 3, at 8 o'clock p. m. The paper for the evening is: "The Canadian Pacific Ry. from Laggan to Revelstoke, British Columbia." Illustrated. By William S. Vaux, Jr.

At the meeting Feb. 17, Dr. Henry Leffmann described the re-survey of a boundary line in which occurred a tree upon whose trunk the initials of the original surveyor had been cut 20 years before. These were clearly discernible upon the bark, and when it was attempted to cut out the surrounding portion with an axe, a section of the trunk fell out containing 20 rings of growth, and showing the letters plainly marked on the inner surface of the trunk. Similar instances were cited by Messrs. E. M. Nichols and L. Y. Schermerhorn.

American Society of Mechanical Engineers.

The fifth junior meeting of the season will take place at the house of the Society, 12 West Thirty-first St., New York City, Tuesday, March 6, at 8:15 P. M. Mr. Bert Charles Ball will present a paper on "Cylinder Proportions of Compound Engines." This paper will take up the method of drawing indicator cards and the proportioning of cylinders of multi-cylinder engines, for varying conditions of service. Mr. Geo. I. Rockwood's theory of compound engines will be considered, and the cylinder proportions of marine and locomotive engines, as well as those of some well-known stationary machines, discussed. The influence of superheated steam on the question of proportion will also be spoken of. The Committee urges that letters on the above subject be sent in by those who cannot attend the meeting, but who may desire to contribute something to the discussion.

Engineers' Society of Western Pennsylvania.

The two hundred and second regular monthly meeting of the Engineers' Society of Western Pennsylvania was held Tuesday evening, Feb. 20.

Resolutions were passed requesting the Congressmen of the district to exert their influence in favor of establishing a bureau for standardizing instruments and materials, similar to those established in foreign countries. Also, to exert their influence in securing the use of the whole of the Patent Office building for the use of the Patent Office, and the revenue of the Patent Office for Patent Office purposes.

The paper of the evening, read by Mr. Willis Whited, was on "Reactions in Swringing Bridge Trusses," and took up the question of the different results obtained with various types of trusses by using different methods of calculation.

The Finance Committee reported that progress had been made toward securing a permanent home for the Society, and that the money would probably be raised by the formation of a joint stock company, the stock of which the members of the Society will be asked to subscribe for.

American Street Railway Association.

The nineteenth annual meeting of the American Street Railway Association will be held at Convention Hall, Kansas City, Mo., October 16, 17, 18 and 19, 1900. Papers will be read on the following subjects:

"Double Truck Cars; How to Equip Them to Obtain Maximum Efficiency under Varying Conditions."

"Construction, Operation and Maintenance of Roads that Operate 20 Cars or Less."

"Comparisons of the Various Systems of Electrical Distribution for Street Railroads."

"Consolidation of Street Railroads and its Effect Upon the Public."

"The Store Room and Store Room Accounting."

"Painting, Repainting and Maintenance of Car Bodies."

The building contains 50,000 sq. ft. of floor space, without a post or obstruction of any kind. Friday, October 19, has been set apart as a day for the examination of the exhibits. The annual banquet will be held Friday evening, when the officers-elect will be installed. The headquarters of the Association will be at the Midland Hotel, and any desiring rooms in this hotel are advised to apply at once.

Car Foremen's Association of Chicago.

The regular meeting of the Car Foremen's Association of Chicago was held in the Monadnock Building, Thursday evening, Feb. 8, 42 members being present. The discussion of Mr. Groobey's paper on "Defects of Uncoupling Devices," which was read at the January meeting, brought out some facts regarding the present M. C. B. couplers. Some favored a heavier uncoupling lever and chain, while a majority seemed to be of the opinion that the M. C. B. couplers in use at present would meet all requirements if maintained in proper condition; that the couplers were allowed to run until they became actually inoperative before any attention was given them. The principal trouble seemed to be loose castings, due to their being applied with lag screws, which are often driven in with a hammer instead of being screwed in, and that this trouble would be greatly lessened by the use of bolts.

Upon motion it was decided that three hours' labor was all that could be charged for renewing a complete set of draft timber bolts at one end of a car, when all the bolts were broken and the draft timbers were down, although some roads were receiving bills for five, and even six hours' labor for such work.

The question as to whether a labor charge was proper for replacing a missing knuckle or brake shoe, on a defect card, brought out the fact that some roads were charging one-half hour labor for each, some one-fourth hour, while others made no labor charge for either. Upon motion it was decided that one-half hour labor for either a missing knuckle or brake shoe would be a proper charge.

American Society of Civil Engineers.

The decision by the Board of Direction to hold the Annual Convention in London was made in consequence of responses to three circulars, the first of which indicated that a convention abroad was desired by many of those who cared to state their preference; the second showed that more than 250 persons connected with the Society would probably attend, accompanied by about an equal number of guests; the third circular gave to each member an opportunity to vote on the question as to whether the Convention should be held in London or in the United States, and resulted strongly in favor of London. The time, the first week in July, was fixed after consultation with the officers of the Institution of Civil Engineers, who have already begun preparations for the reception and entertainment of our members.

The Secretary has just received a letter from the Secretary of the Institution, in which he states: "I am instructed to inform you that the President and Council have now fixed the annual conversazione of this Institution for Thursday, the 5th July, when they will desire to extend a very cordial invitation to those Members of your Society who may be in London then, as well as to the ladies of their families, to attend that entertainment. This conversazione, which leads to perhaps the largest annual gathering of engineers from all parts of the country, is, on this particular occasion, to be held, by the kind permission of the Corporation of the City of London, in the rooms of their ancient Guildhall; and the President and Council desire to take this early opportunity of expressing a hope that they may, in due course, receive the names of any members of your Society, whether traveling in an organized party or individually, to whom official invitations may be issued to attend that function." It appears to the Committee that it is due to the Institution that the probable number who will be in London during that week should be stated as soon as possible.

Engineering Association of the South.

The regular meeting of the Association was held Thursday, Feb. 8, at Nashville, Tenn. President Geddes was in the chair; H. M. Jones, Secretary; and present, resident members, 14; non-resident members, 3, and visitors, 2.

Communications from several parties as to the formation of local societies as branches of the E. A. S. were read and discussed, the outcome of which was the appointment of a committee of three members to consider the subject and make such recommendations as they considered most wise at the next meeting.

Mr. W. M. Leftwich, Jr., City Engineer of Nashville, Tenn., presented a paper on "The Approaches to the Viaducts on Church and Broad Sts." The paper was thorough, going into all details of construction and design, and the progress of the work was illustrated by a score or more of excellent photographs.

Maj. E. C. Lewis, of Nashville, Tenn., gave a comparative study of the "Nicaragua and Panama Canal Routes." The conditions existing at each location were described; the difficulties to be overcome and the advantages after completion were compared; the writer's conclusions being that the facts were favorable to the completion of the Panama Canal. The main points justifying this view being, the bed of the canal would be at a much less height above the sea level, necessitating fewer locks, deep harbors of a permanent character were at the termini, length of the canal was far shorter, affording quick passage of ships, and the canal already being about half completed with all necessary equipment for its completion on the ground. A lively discussion of the subject followed, Mr. Lodge, of South Pittsburgh, adding some interesting facts from a personal visit and inspection of the Panama Canal.

The Engineering Association of the South will issue a quarterly publication which will be sent out in February, May, August and November. The Secretary is Mr. H. M. Jones, 1000 Broad St., Nashville, Tenn.

PERSONAL.

(For other personal mention see Elections and Appointments.)

—Mr. H. W. Taylor, at one time Auditor of the South Atlantic & Ohio (Virginia & Southwestern), died of pneumonia Feb. 25 at Bristol, aged 40 years.

—The marriage of Mr. James B. Stetson, President and General Manager of the North Pacific Coast Railroad, and Mrs. Eleanor Doe, took place at noon Feb. 19.

—Mr. W. A. Lieberman, Division Mechanical Engineer of the Russian State railroads, is now in this country having made the journey from Moscow, largely for the purpose of studying the locomotive plant and the testing methods in use at Purdue University. He expects to be in this country about two weeks.

—Mr. Edward Grafstrom has been appointed Mechanical Engineer of the Illinois Central Railroad in place of Mr. W. H. V. Rosing, promoted. He takes up his new duties March 1. Mr. Grafstrom has been with the Pennsylvania Railroad and the Pennsylvania Lines since 1882, always in the motive power department. He is a graduate of the Boras Technical College, Sweden, and is a member of the American Society of Mechanical Engineers.

—Mr. Hugh M. Comer, President of the Central of Georgia, died at his home in Savannah, Ga., Feb. 26, aged 58 years. For many years Mr. Comer was a cotton merchant at Savannah. When the Central of Georgia went into the hands of the courts in 1892, he was appointed Receiver, and was so successful in reorganizing the company that he has since continued as its President. Mr. Comer was also President of the Ocean Steamship Co., and of the Georgia Export & Import Co.

—Mr. Matthew W. Hyland died of pneumonia at his home in Chicago Feb. 20, aged 77 years. Mr. Hyland was born in Ireland in 1823 and came to New York in 1849, engaging in the contracting business, and later removed to Boston, where he superintended building the Lowell woollen mills. In 1860 he went to Chicago and entered the service of the bridge department of the Chicago & Northwestern, remaining with that road for 15 years. He retired from active work 20 years ago. One son, John J. Hyland, is Traffic Manager of the Chicago Board of Trade, and the other, David M. Hyland, is Assistant City Electrician of Chicago.

—As noted in January last, Mr. W. S. Moore has been transferred to Cleveland, O., as Engineer Maintenance of Way of the Cleveland-Indianapolis Division of the Cleveland, Cincinnati, Chicago & St. Louis. Mr. Moore was born in Norfolk, Va., May 14, 1870. Since 1888 he has served under engineers as rodman, tapeman, etc. His first railroad work appears to have been with the Chicago & Northwestern, beginning in May, 1891, when he became draughtsman of the Bridge Department at Grand Rapids, Mich. He entered service with his present road, the Cleveland, Cincinnati, Chicago & St. Louis, in October of the same year as Assistant Engineer of the Michigan Division. In March, 1894, he was made Acting Engineer, and in September of the same year Engineer of the Michigan Division. His transfer to Cleveland was made on Jan. 22 last.

—Mr. H. Milton Kennedy has resigned as General Passenger Agent of the lines of the Brooklyn Rapid Transit Co., to enter a larger field where transportation will play an important part. The resignation took effect March 1. Mr. Kennedy's railroad career dates back to 1894, when he became excursion agent of the South Jersey RR., and in less than a year, at the age of 24, he became General Passenger Agent of the road. Mr. Kennedy conceived the idea that traffic on street railroads could be diverted and worked up in a manner similar to that employed by steam railroads and he was, in March, 1896, appointed General Passenger Agent of the Brooklyn Heights RR., now a part of the Brooklyn Rapid Transit System. This was, as far as we can learn, the first general passenger department to be established by a street railroad.

—Mr. Leander J. McCormick died at the Virginia Hotel, Chicago, on Feb. 20, of pneumonia, aged 81 years, and the funeral services were held on Feb. 22. Mr. McCormick, with his brother, Cyrus H. McCormick, in 1848 founded the McCormick Harvesting Co. of Chicago, building harvesting machinery, their father, Robert McCormick, having been engaged in the same work in Virginia since 1816. Leander McCormick was born in Rockbridge County, Virginia, Feb. 8, 1819, and after the death of his father in 1845 went to Cincinnati, where in 1847 he built some machines, while his brother, Cyrus H. McCormick, went to Chicago. In 1848 Leander McCormick went to Chicago and joined his brother in the firm which has since become so widely known. He was Superintendent of the manufacturing department until, in 1879, the business was incorporated under its present name, and he was actively engaged in the business until 1889, when he retired. He was interested in various industries and enterprises in addition to the reaping machines, and was the founder of the Leander McCormick observatory of the University of Virginia at Charlottesville.

—Gen. John McNulta, who was Receiver (and practically General Manager) of the Wabash road (east of the Mississippi) in 1887, 1888 and 1889, died suddenly at Washington, D. C., on Feb. 22. Gen. McNulta had been apparently in good health, the cause of death being angina pectoris. Gen. McNulta was born in New York City in 1837 and until he was about 21 had many struggles in which he developed remarkable energy. In 1859 he became interested in mercantile business at Bloomington, Ill. At the outbreak of the war he enlisted in the army and rose to the rank of Brevet Brigadier General. After the war he began the practice of law and was a State Senator in 1868. His law practice led him into relations with corporations and he became known as the "Great American Receiver." He was appointed receiver of the Toledo, St. Louis & Kansas City in 1885 and two years later succeeded Judge Cooley as Receiver of the Wabash. His administrations were highly creditable on both roads. He has been Receiver of many large interests since he left that road, including the Calumet & Blue Island Electric railroad in Chicago. For the last four years Gen. McNulta had lived in Chicago, where he was a member of several prominent clubs.

—Mr. H. S. Rearden, who has just been made Agent for the purchaser of the Quincy, Carrollton & St. Louis, was born on a farm near Shawneetown, Ill., April 6, 1858. Completing his education in 1878, he entered railroad service as assistant to the agent of the St. Louis & Southeastern (now the Louisville & Nashville) in his native town. There he studied telegraphy for two years. Then for a year following September, 1880, he served as freight brakeman and baggage master for the same company. From September, 1881, to February, 1891, he was with the Louisville, Evansville & St. Louis as freight and passenger agent and telegraph operator until October, 1894, and then as freight and passenger conductor and Superintendent of the East St. Louis Terminal. In February, 1891, he was made Trainmaster of the Louisville Southern, and in 1893, Master of Transportation of the Jacksonville Southeastern Lines. From May, 1894, to January, 1898, he was General Superintendent of the Chicago, Peoria & St. Louis. Then, until March, 1899, he was General Superintendent of the Detroit, Toledo & Milwaukee (now Cincinnati Northern). From May until October of 1899 he was General Manager of the Omaha, Kansas City & Eastern and the Omaha & St. Louis. He is now Agent for the purchaser of the Quincy, Carrollton & St. Louis, his duties being those of General Manager.

—Mr. H. S. Spangler, in addition to his duties as General Manager of the Gulf & Inter-State Railway of Texas, is also General Superintendent of the Gulf, Beaumont & Kansas City. These two roads, although under separate charters, are operated as one continuous line. Mr. Spangler was born Jan. 17, 1864, at Williamsport, Md. He began railroad service at 12 years of age as a telegraph operator for the Western Maryland at Williamsport, Md. After holding this position four years, he became agent and operator for the Shenandoah Valley, now part of the Norfolk & Western. The following year he went to the Missouri Pacific as a telegraph operator, working upward to Traveling Auditor of the Texas & Pacific in 1888. That year he became Traveling Auditor of the Texas Lines of the Southern Pacific. Four months later he was made Chief Traveling Auditor of the system and continued in that capacity for five years, when he was appointed Chief Clerk to the General Auditor of the system. For eight months during 1897 he served as General Agent for the Texas State Railroad Commission at Houston. Then on Dec. 10 of that year he undertook the reorganization of the Gulf & Inter-State. On Jan. 10, 1898, he was made General Superintendent, and in April, 1899, General Manager of the property. When the road, in November, 1899, came under the control of the Gulf, Beaumont & Kansas City, he was retained as General Manager.

—The new General Manager of the St. Louis, Kansas City & Colorado, Mr. L. M. Fouts, is also President and General Manager of the Weatherford, Mineral Wells & Northwestern. He was born at New Washington, Ind., July 22, 1854. Mr. Fouts entered railroad service in February, 1869, as a rodman on the Kansas City & Memphis. For two years following he was rodman, and subsequently Division Engineer on the Missouri, Kansas & Texas. Then, for a few months until May, 1872, he was a contractor on the same road in Indian Territory and Texas. For three years following 1873, he was clerk and assistant ticket agent of the Union City offices at Kansas City, Mo. From October, 1876, to April,

1880, he served as division clerk of the St. Louis, Kansas City & Northern and Wabash, St. Louis & Pacific roads at the same point. For about one year until June, 1882, he was Superintendent of Construction for the contractors of the Denver, South Park & Pacific and the Denver & New Orleans in Colorado. Then, until May 1, 1890, he was Superintendent of the Denver, Utah & Pacific (now the Burlington route) at Denver. He became General Manager of the Weatherford, Mineral Wells & Northwestern at Weatherford, Tex., on May 1 1890, and in October of the following year he was made President of the same road. He assumed his new duties in addition to these as General Manager of the St. Louis, Kansas City & Colorado on Feb. 1.

—Dr. James Henry Smart, A. M., LL.D., since 1883 President of Purdue University, died at his home in La Fayette, Ind., Wednesday evening, February 21. His death can be attributed directly to overwork. Dr. Smart was born at Center Harbor, N. H., June 30, 1841, and received his early education at Concord, although his education was principally obtained by study alone and under tutors, while teaching in various New Hampshire schools.. For ten years he was superintendent of the public schools at Ft. Wayne, Ind., and from 1874 to 1881 he was State Superintendent of Public Instruction of Indiana, and in 1883 was made President of Purdue. In 1870, the degree of Master of Arts was conferred upon him by the Indiana State University, and in 1874 the same degree was conferred by Dartmouth College. At different times, Dr. Smart was a Commissioner for the State of Indiana to the Paris Exposition and to the Vienna Exposition and served as trustee for several of the State institutions. Dr. Smart's public life had been spent almost entirely within the State of Indiana. To the discharge of the duties of each of these positions he brought vigor and enthusiasm such as is not often seen in the work of a public officer. As member of the State Board of Education he was largely instrumental in shaping the legislation which underlies the present excellent school laws of Indiana, and, as President of Purdue, he had in a few years produced from small beginnings an institution which may justly be ranked among the leading schools of the country. His health had been uncertain for many years, and he had frequently suffered from prolonged illness. It is doubtful if at any time during his service at Purdue he had been entirely free from bodily pain, but all this did not in the least dull his intellect or abate his enthusiasm. He kept in touch with the more important business affairs of the University up to the day of his death, and enjoyed listening to the details of operation almost to the last. Whatever he undertook to do, he did with such energy and discretion that the result was attained even before his friends realized it. In his death, Purdue, the community in which he lived, and the State and nation suffer a real loss.

ELECTIONS AND APPOINTMENTS.

Atlantic Coast Line.—A. B. Corinth has been appointed Assistant Superintendent of Motive Power, in charge of the car department at Wilmington, succeeding J. H. Davis, resigned.

Baltimore & Ohio.—The line between Philadelphia and Chicago, via Benwood, will be operated as two grand divisions, as follows: Thomas Fitzgerald is General Superintendent of the Philadelphia Division and the Main Line and Branches, including the West Virginia & Pittsburgh RR., with headquarters at Central Building, Baltimore; J. C. Stuart is General Superintendent of the Middle and Northwestern Divisions (formerly known as the Trans-Ohio Division), at Chicago, Ill., effective March 1. H. N. Breneman has been appointed General Boiler Inspector, with headquarters at Mt. Clare, Baltimore, Md.

Delaware, Lackawanna & Western.—T. Thatcher, Master Mechanic at Utica, N. Y., having been transferred, the duties of that office have been assumed by F. W. Williams of Syracuse, N. Y.

Great Northern.—George H. Emerson has been appointed General Master Mechanic of the Western District, with headquarters at Spokane, Wash. T. Roope has been appointed General Master Mechanic of the Eastern District, with headquarters at St. Paul, Minn., effective Feb. 22.

M. T. Fisher has been appointed Master Mechanic, with headquarters at Kalispell, Mont., succeeding J. R. Van Cleve, resigned. A. D. Page has been appointed Bridge Engineer at St. Paul, Minn., succeeding M. Toltz.

Illinois Central.—Edward Grafstrom, late with the Pennsylvania Lines, has been appointed Mechanical Engineer of the I. C., succeeding W. H. V. Rosing, promoted. After March 1 Mr. Grafstrom's headquarters will be at 1 Park Place Chicago, Ill.

Lake Erie & Western.—Owing to the absorption of the L. E. & W. by the Lake Shore & Michigan Southern, Geo. L. Bradbury has been elected Vice-President, with headquarters at Chicago, Ill. The following appointments have been made: P. S. Blodgett, General Superintendent, succeeding D. S. Hill; G. J. Grammer, General Traffic Manager, and E. A. Handy, Chief Engineer, with headquarters at Cleveland, O., succeeding T. H. Perry. Mr. Blodgett, Mr. Grammer and Mr. Handy all hold similar positions on the L. S. & M. S. F. H. Greene has been appointed Purchasing Agent at Cleveland, O. Mr. Hill and Mr. Perry will assume other duties with the L. E. & W., as may hereafter be assigned to them, effective Feb. 20.

Lehigh Valley.—E. Y. Hartshorne, heretofore Assistant Purchasing Agent, has been appointed to succeed D. G. Baird as Assistant Secretary.

Louisville & Atlantic.—W. H. Adams, Superintendent at Richmond, Ky., has resigned, effective March 1.

Mobile & Ohio.—J. J. Thomas, Jr., has been appointed Assistant to the Superintendent of Motive Power and Car Equipment with headquarters at Mobile, Ala. M. Kirby succeeds Mr. Thomas as Master Mechanic of the Montgomery Division at Tuscaloosa, Ala.

Oklahoma & Southern.—The officers of this company, referred to in the Construction column, are: President, A. J. Titus, Anthony, Kan.; Secretary, J. B. Randels, Authony, Kan.; Treasurer, T. J. Brockway, Augusta, O. T.; Superintendent of Construction, Jas. A. Titus, Jefferson, O. T.; Chief Engineer, R. B. Burchfiel.

Oregon Short Line.—The statement made by a contemporary that Wm. Ashton, heretofore Division Engineer of the Union Pacific, had been appointed Chief Engineer of the O. S. L., is incorrect. Mr. Ashton has been appointed Resident Engineer.

Pacific & Idaho Northern.—C. R. Shaw has been appointed Superintendent, succeeding Frank L. Richmond. Godfrey Sperling becomes Assistant Treasurer.

Pennsylvania.—H. M. Carson, heretofore Assistant Engineer of Motive Power at Altoona, Pa., has been appointed Master Mechanic, with headquarters at Pittsburgh, succeeding D. O. Shaver.

Philadelphia & Reading.—L. Horton, Jr., Superintendent of Telegraph at Reading, Pa., has tendered his resignation to take effect about April 1.

St. Louis & San Francisco.—George A. Hancock, heretofore Assistant Superintendent of Machinery of the Atchison, Topeka & Santa Fe., has been appointed Superintendent of Machinery of the St. L. & S. F., succeeding J. R. Groves, resigned.

Southern.—W. A. Bean has been appointed Track Supervisor at Knoxville, Tenn., succeeding W. T. Dobbins, who has been transferred as Track Supervisor at Asheville, N. C.

Union Pacific.—N. W. Chapman, Assistant Superintendent at Omaha, Neb., has resigned.

Wheeling & Lake Erie.—Charles Blackwell has been apointed Chief Engineer, succeeding F. E. Bissell, who has resigned to accept service with another company, effective Feb. 19.

John Bean having resigned as Master Mechanic of the Cleveland Division, the position has been abolished, and the jurisdiction of J. E. O'Hearne, Master Mechanic of the Toledo Division, has been extended over the territory formerly under the supervision of Mr. Bean.

RAILROAD CONSTRUCTION.
New Incorporations, Surveys, Etc.

ALABAMA ROADS.—The Cherokee Mining & Manufacturing Co. of Chattanooga, Tenn., writes that it has not yet been fully decided to extend the road to reach ore deposits. (Feb. 23, p. 127.)

ALASKA ROADS.—Henry Villard and associates, according to report, are having surveys made for a road along the route recently explored by Capt. W. R. Abercrombie for the U. S. Government, from the ocean at Port Valdes north along the Copper River Valley to Fort Egbert, on the Yukon.

ALGOMA CENTRAL.—Building is begun on the main line from Sault Ste. Marie north to Missanabie. The company expects to have about 2,000 men at work by April 1. The road is practically completed from Michipocoten Harbor to Dalton. (Nov. 10, 1899, p. 787.)

ATCHISON, TOPEKA & SANTA FE.—Surveys are reported in progress for a spur one mile long from the main track in Pueblo, Col., to Rocky Ford.

ATLANTA, KNOXVILLE & NORTHERN.—Work is reported begun on a new cut-off of six miles near Hiawassee, Tenn., to avoid a heavy grade. Shea & McFarland, of Knoxville, have the contract.

BALLSTON.—The Virginia Legislature has passed a bill to incorporate this company to build a railroad from a point on the Potomac River opposite Washington, D. C., to run south about 35 miles to Stafford. The incorporators are: Judge J. K. M. Norton, J. F. Carlin, C. Harry Yohe, Joseph Broders and J. Marriott Hill.

BALTIMORE & OHIO.—Land has been bought at Columbus, O., according to report, to enlarge the terminal facilities.

Surveys are reported in progress for a fourth track from Englis, W. Va., to Tanvers near Martinsburg.

Press reports state that a branch is to be built from Salem, Harrison County, W. Va., to Williamstown in Wood County, but an officer writes that nothing definite is determined.

BALTIMORE & OHIO SOUTHWESTERN.—An officer writes that there is nothing in the report that an extension is to be made soon from Beardstown, Ill., to Quincy. (Feb. 16, p. 111.)

BATCHAWAMING & JAMES BAY.—Wm. Morris is making application to the Ontario Legislature for a railroad from a point on Batchawana Bay on Lake Superior, to a point on the main line of the Canadian Pacific, about 40 miles north of the "Soo"; thence north to James Bay at or near the mouth of the Albany River, about 600 miles. The usual subsidy of $3,200 per mile will be asked for.

BAY & COAST.—The city of San Francisco has refused this company a franchise through the city for its proposed line from San Francisco south about 100 miles to Santa Cruz. L. H. Barnard of Oakland, Cal., is an incorporator. (Jan. 19, p. 47.)

BEAVER VALLEY.—Surveys are completed, but it is not determined when grading will be begun on this line from West Bridgewater, Pa., on the Pittsburgh & Lake Erie to the Ohio River, near Vanport, 3½ miles. J. N. Pew is President, and W. A. Clugston, Chief Engineer, both of Pittsburgh. (Sept. 22, 1899, p. 667.)

BELAIR & HAVRE DE GRACE.—A bill has been introduced at Annapolis, Md., to incorporate this company, with a capital stock of $10,000, to be increased to $500,000, to build a steam or electric railroad from Belair east about 15 miles to Havre de Grace, with a right to build branch lines through the county of Harford. The incorporators are: John H. Reckord, Hanson H. Haines, William E. Robinson, W. Beatty Harlan, James R. Massey, Thos. Mackenzie, Noble L. Mitchell and Harry E. Karr.

BRIGANTINE.—This company has been organized in New Jersey to build a railroad from Tuckerton south about 12 miles to Brigantine Junction. It is stated that this is to form a connecting link for a new line to Atlantic City. The proposed route is over the Central of New Jersey from Jersey City, via Red Bank and Lakewood to Whiting's Junction, and thence over the Tuckerton to Tuckerton; then over the new Brigantine to Brigantine Junction and running into Atlantic City over the tracks of the Philadelphia & Reading. George H. Cook of New York is President of the new company.

BROCK'S GAP.—Mr. Keezel has offered a bill in the Virginia Assembly to incorporate this company, with a capital stock of $100,000, to build a railroad from Broadway in Buckingham County, up the Shenandoah River, through Brock's Gap to a point in Hardy County, W. Va.

CANADIAN PACIFIC.—Application is made to the city of Toronto for permission to build aditional sidings from the company's Queen's wharf track along Liberty St., to Jefferson Ave.

Application is being made in behalf of the Toronto, Grey & Gruce, leased by the C. P. R., to the Railroad Committee of the Privy Council, for permission to build a branch line from a point on their line in the city of Toronto, to a point on the southern limit of Fraser Ave., in the suburbs of the city.

An officer of the Guelph Junction writes that an extension of the line from Guelph, Ont., west about 81 miles to Goderich, has been in contemplation ever since the branch was built to Guelph. The matter depends upon the good will of the C. P. R., and pressure is being brought to bear to induce the company to take it up. The location is not yet decided and has been the subject of very extensive discussion. There are three routes, known as the northern Midland Southern. A rough survey was made by the C. P. R. engineers some years ago. The work will not be difficult nor the grades at all extreme except for the approach to the water at Goderich. There is only one bridge of importance. (Dec. 29, 1899, p. 901.)

CANSO & LOUISBURG.—The company invites offers for 200,000 ties and 3,300 telegraph poles to be delivered before July 1, for its proposed line from Hawkesbury, N. S., via St. Peters and Grand River to Louisburg. Isidore Le Blanc of Arichat, N. S., is interested. (Dec. 29, 1899, p. 901.)

CHICAGO & NORTHWESTERN.—Work is to be begun in the spring, according to report, on a branch from Watersmeet, Mich., to Mass City, 21 miles, to give an outlet over the new Copper Range Road to Houghton.

CHICAGO, MILWAUKEE & ST. PAUL.—Options onl and are being obtained, according to report, for an extension north from a point on the main line just west of Elgin, Ill., to run through Dundee and Carpentersville to Delevan Lake.

CHICAGO, ROCK ISLAND & PACIFIC.—The company has located 50 miles of the proposed extension from Mountainview, Okla., westward. Somewhat less than this will be built, the exact terminus not having yet been decided. Contractors are now moving upon the work. Creech & Lee of Kansas City have the first 20 miles, and the remaining section is not contracted. The company will build its own bridges and lay its own track. Work is not heavy, being about the average prairie country. Maximum grades westward are one per cent.; eastward, 0.8 per cent. Maximum grades are 3°. (Feb. 23, p. 127.) There are no bridges of importance and no tunnels along the line. (Official.)

CHIPPEWA VALLEY & NORTHERN.—This company has been organized in Wisconsin, with a capital stock of $150,000, to build a railroad from Bruce, on the Minneapolis, St. Paul & Sault Ste. Marie, to run north about 50 miles to Hayward. The incorporators are: Daniel J., Edmund P., Joseph Z., and Arthur M. Arpin, and W. R. Mellen, all of Grand Rapids, Wis.

CHOCTAW, OKLAHOMA & GULF.—Location is in progress for the proposed extension from Weatherford, Okla, west 203 miles to Amarillo, Tex., on the Atchison, Topeka & Santa Fe. Extensive surveys are being made toward Denison, Tex. (Oct. 20, 1899, p. 737.)

COLORADO SPRINGS & CRIPPLE CREEK.—Carlyle, Ditmer & Weitbreck of Pueblo, Col., have been awarded the contract for the second section of 18 miles from the halfway house to Cameron, on this line from Colorado Springe, Colo., west 36 miles to Cameron. Orman & Crook of Pueblo are building the other section. A. C. Ridgeway of Cripple Creek, Colo, is General Manager. (Jan. 12, p. 29.)

DARIEN & WESTERN.—The stockholders have authorized the directors to take steps toward extending their line from Middletons, Ga., northwest about five miles to Walthourville on the Savannah, Florida & Western. The route is to be investigated further northwest about 50 miles to a connection with the Georgia & Alabama, probably at Lyons.

DAVENPORT, ROCK ISLAND & NORTHWESTERN.—Surveys are reported in progress for the extension from Davenport, Ia., southeast about 85 miles to Peoria, Ill. The company is controlled by the American Steel & Wire Co., which also under the title of the Pittsburgh & Ohio Valley is proposing to build a railroad on Neville Island at Pittsburgh, Pa.

The stockholders of the American Steel & Wire Co., at the annual meeting at Jersey City, N. J., Feb. 20, voted to adopt an amendment under which the company may build and operate railroads. (Feb. 16, p. 111; P. & O. V., Feb. 9, p. 96.)

DENVER, KINGFISHER & GULF.—A company under this title proposes to build a railroad from Denver, Col., south over 1,000 miles via Dodge City and Kiowa, Kan., Kingfisher and Oklahoma City, Okla.; Paris, Tex., and Beaumont to Sabine Pass. The line has been surveyed from Kiowa, Kan., to Oklahoma City, 140 miles, and has been graded from Okeene to Kingfisher, 30 miles. L. E. Woodworth, of Plymouth, O., has the contract for this section. A contract is to be let soon for grading 40 miles from Kingfisher to Oklahoma City. The immediate purpose is to build from Kiowa to Coalgate, I. T., 270 miles. P. J. McLean, of New York, is President; J. D. Love, Arkansas City, Kan., Chief Engineer.

ENSLEY SOUTHERN.—Surveys are completed and contracts are to be let about March 1, for this line from Parrish, Ala., terminus of the Northern Alabama line of the Southern, to run southeast 36 miles to Ensley. Grading is to be begun about March 15. The road is under the control of the Southern.

ESCANABA & LAKE SUPERIOR.—This company, according to report, has decided to spend $500,-

000 in making extensions and in buying new rolling stock. It is proposed to extend the road to a connection with the Chicago, Milwaukee & St. Paul, which is said to have bought the property. The property now extends for about 34 miles northwest from Escanaba, Mich. (June 16, 1899, p. 439.)

GREAT NORTHERN.—Surveys are practically completed for the proposed extension from Wenatchee, Wash., on the main line, to run north about 130 miles to Republic.

The company has filed its plans in the U. S. Land Office at Kalispell, Mont., for the proposed change of the line between Kalispell and Libby Creek. It leaves the old line at a point seven miles west of Kalispell and follows along near the old line for many miles on much higher ground to a point about three-fourths of a mile east of Marion. It then runs southwest down the Little Bitter Root, which it crosses at Pine Prairie; then west to McGregor's Lake and down Pleasant Valley Creek to Fisher, and thence along Fisher to Meadow Creek to the head of Swamp Creek. It then follows Swamp Creek and Libby Creek to a point about three miles west of Libby. (Oct. 6, 1899, p. 701.)

HELENA, TUPELO & DECATUR.—Under this title the road referred to last week under New Roads (p. 128), is projected from Arkansas City, Ark., east 225 miles through Coffeeville and Tupelo, Miss., and Moulton, Ala., to Decatur, about 145 miles being in Mississippi and 80 miles in Alabama. The road was surveyed several years ago. H. C. Medford, of Tupelo, Miss., is Secretary, and E. C. Finley, of Wharton, Tex., Chief Engineer.

KANSAS CITY, FORT SCOTT & MEMPHIS.—Contracts are reported let for several sidings to coal mines in Walker County, Ala., for the Kansas City, Memphis & Birmingham.

KANSAS CITY, WATKINS & GULF.—A contract is reported let and work begun to fill Indian Creek at its crossing about 15 miles from Alexandria, La.

KENTUCKY ROADS.—The Peach Orchard Coal Co. will build about half a mile of standard gage road to its mines.

LAKE ERIE & DETROIT RIVER.—Surveys are in progress for the extension from Ridgetown, Ont., to run northeast 44 miles to St. Thomas. (July 14, 1899, p. 515.) The intention is to begin work as soon as possible. (Official.)

LITCHFIELD & MADISON.—This company has been incorporated in Illinois, with a capital stock of $500,000, to build a railroad from Litchfield, Montgomery County, to Madison, St. Clair County. The principal office is Springfield, Ill. The incorporators are: Bluford Wilson, Ralph Blaisdell and Philip B. Warren of Springfield, and James Duncan, Alton, Ill.

MISSOURI, KANSAS & NORTHWESTERN.—This company has been organized at Joplin, Mo., to build a railroad from Mineral City, Kan., on the Missouri, Kansas & Texas., to run east via Columbus and Galena, Kan., and Joplin, Mo., Webb City, Carterville and Oronogo, to Carthage, Mo. Judge O. H. Picher, E. O. Bartlett and Joseph Stewart of Webb City, and J. C. Murdock of Galena, and Richard Nevins, Jr., of Joplin, Mo., are interested. Surveys are reported in progress and the company expects to begin grading within 60 days.

NEW YORK CITY RAPID TRANSIT.—For an account of the signing of the contract and other items of interest see page 134.

NORFOLK & WESTERN.—Extensive improvements are reported in progress on the line near Keystone, Va., including several miles of double track. Walton, Witten & Graham, of Falls Mills, Va., have the contract.

OKLAHOMA & SOUTHERN.—Organization is just completed for acquiring right of way and for grading this line from Kiowa, Kan., southeast into Lincoln County, Okla. The line is surveyed and mostly graded from Kiowa to Augusta, Okla., 33 miles, and it is proposed to begin track laying about June 1. The maximum grades are 1 per cent., and the maximum curves 3°. (Feb. 23, p. 128.) The officers are given under Elections and Appointments. (Official.)

ONTARIO ROADS.—W. H. Moore of Toronto is applying to the Legislature of Toronto for a charter to build an elevated railroad in Toronto, and a surface railroad through the counties of York, Peel, Halton, Wentworth, Durham and Simcoe.

Messrs. Montgomery, Fleury & Montgomery of Toronto are applying for a similar charter for elevated and surface roads through Toronto and the surrounding municipalities within a radius of 30 miles.

PENNSYLVANIA.—Work is begun, according to report, on eliminating about 30 grade crossings between Norris and Butler Sts. in the city of Philadelphia, under the ordinance of Feb. 2, 1897.

The United States Senate has passed a bill granting the Allegheny Valley additional right of way through the arsenal grounds at Pittsburgh, Pa.

Drake & Stratton have been awarded the contract for rebuilding the railroad yards at Huntingdon, Pa., at cost, it is stated, of about $400,000.

Clements, King & Co., of Pottsville, Pa., have been awarded a contract for completing the four-track work between Petersburg and Barree, Pa. (Feb. 16, p. 112.)

P. F. Brendlinger and John C. Neil of Philadelphia have the contract for building six miles of additional track between Coatesville and Hope's Tower. (Feb. 23, p. 128.)

In the annual report of the Philadelphia & Erie, the President states that the heavy tonnage and the increased size of the rolling stock will require large outlays on the tracks. The Pennsylvania has consented to remit 3 per cent. dividend, amounting to $72,000, on its special stock of $2,400,000 held by the company, in addition to a similar amount so appropriated last year. The company has also set aside $150,000 to the extraordinary expenditure fund for use during this year for such expenditures.

PENNSYLVANIA COMPANY.—The Toledo, Peoria & Western, according to report, will lay 10 miles of new steel from Washington, Ill., east. This is part of 1,000 tons of rail ordered last year and now arriving.

PETERSBURG & CLAREMONT TERMINAL.—This company was incorporated in Virginia under an act of Feb. 9, with a capital stock of from $100,000 to $10,000,000, to build a railroad from a point near Petersburg to run east about 20 miles to the James River at or near the town of Clarmont. The incorporators are: George J. Seay, Petersburg, Va.; J. R. Hopper, C. A. Santnayer, H. J. Arringtong, George H. Woods, John E. Farrell, Thomas A. Stewart, C. F. Dibbell, Claremont, Va., and Mann Page, Brandon, Va.

POCAHONTAS, COAL RIVER & KANAWHA.—Grading has been suspended on this line owing to the reported failure of the Equitable Construction Co., of New York, to pay for labor and supplies. The intention of the railroad company is to let the contract anew. The road is projected from St. Albans, W. Va., on the Pittsburgh & Ohio, up Coal River about 20 miles into the Pocahontas coal section. Gen. C. C. Watts, of Charleston, W. Va., is President. (Jan. 12, p. 30.)

PORT HURON SOUTHERN.—Surveys are completed and building is to be begun about March 1 for this line from Port Huron, Mich., south six miles to a point on the St. Clair River. No contracts will be let. J. W. Cooper, St. Paul, Minn., is President. P. Reiss, Port Huron, is Vice-President. (Feb. 9, p. 96.)

QUEBEC ROADS.—Messrs. Foster, Martin & Lemieux of Montreal are applying to the Dominion Parliament for a charter to build a railroad from Ha Ha Bay at the Saguenay River to the Great Falls of the River Grand Perribonka, and thence to Montreal, with branch lines to tap Quebec and Lake St. John, and to reach La Tuque on the River St. Maurice.

QUEEN & CRESCENT.—The Alabama Great Southern will replace about 30 miles of 60-lb. rail north of Attalla, Ala., with 75-lb. steel.

RIO GRANDE WESTERN.—The Utah Construction Co. of Ogden, Utah, has taken a contract, according to report, for straightening the curves on the line between Salt Lake City, Utah, and Park City. A narrow gage line from Mill Creek Junction, about five miles, is to be made broad-gage. (Nov. 24, 1899, p. 819.)

ST. LOUIS, KENNETT & SOUTHERN.—Grading is nearly completed on an extension of this line from Arbyrd, Mo., south about nine miles to Boynton.

ST. LOUIS, LOW GRADE & SOUTHERN.—This company has been incorporated in Illinois, with a capital stock of $50,000, to build a railroad from East St. Louis, to run through the counties of St. Clair, Monroe, Randolph, Jackson, Union and Alexander to Cairo, with branches to the Big Muddy coalfields in Jackson County. The principal office is East St. Louis. It is stated that building is to be begun at once. The incorporators are: Henry A. Schwanke, Marshall, Ill.; Whitney Gilbreath, Ava, Ill.; John Calligan and A. L. Bernard, St. Louis, Mo.; H. L. Pugh and Erman Pugh, East Carondelet, Ill.; Louis J. Dyroff, Imbs, Ill., and Louis Dudenbostel, Chester, Ill.

SILVERTON.—This company has been organized at Silverton, Ore., to build a line from Salem through Silverton, and eventually to Oregon City, about 50 miles. Right of way is reported obtained. P. W. Geer, of Silverton, Ore., is interested.

SOUTHERN.—According to report, the building of a line from Stevenson, Ala., northeast about 40 miles to Chattanooga, Tenn., has been deferred through legal complications raised by the minority stockholders of the Memphis & Charleston. (Dec. 29, 1899, p. 902.)

Surveys are begun by Mr. R. E. Harwood for an extension south from Allendale, S. C.

Recent surveys have been made for a line from the Western North Carolina north about eight miles to shoals on the Catawba River which are to be developed by cotton mill organizations. A line of about the same length has been run from Sloans on the Taylorsville Branch to the same shoals.

SOUTH GEORGIA.—An amendment has been made to the charter enabling the company to extend its line from Quitman south to the Florida line. The ultimate point is said to be at Tampa, Fla. (Jan. 19, p. 48.)

TEXAS NORTHERN.—Contracts are about to be let for building this line from Anderson, Tex., south about 12 miles to Stoneham, on the Conroe Branch of the Atchison, Topeka & Santa Fe. F. B. Johnston, of Anderson, Tex., is President, and H. J. McNair, Chief Engineer. (Oct. 20, 1899, p. 738.)

TEXAS ROADS.—Surveys are in progress and building is to be begun about April 1 for the line by the State of Texas from the Brazos River to Peach Point, five miles. John W. Maxcey, of Houston, Tex., is Engineer in Charge. (Feb. 23, p. 128.)

The Commercial Lumber Co., of Gilmer, Tex., is interested in a proposed railroad from Asbury east through Gilmer to Harleton. M. E. Sullenberger is President.

UNION CENTRAL.—Grading is begun, according to report, on this line from Waco, Tex., east about 100 miles to Palestine. Cyrus Baldridge of Kansas City, Mo., is President. James S. Bell, 35 Nassau St., New York, is interested. (Dec. 29, 1899, p. 902.)

VICTORIA MINES.—Messrs. McPherson, Clark, Campbell & Jarvis of Toronto have given notice of application to the Ontario Legislature for a charter to build a railroad in the districts of Algoma and Nipissing from a point in the District of Denison, to a point between Whitefish and Worthington Station on the Canadian Pacific; also from a point in the Township of Garson to the Stobie Branch of the C. P. R.

VIRGINIA & SOUTHWESTERN.—Surveys are reported completed for a branch from Elizabethton, Tenn., west about 10 miles to Johnson City.

VIRGINIA ROADS.—A press dispatch from Luray, Va., states that the Shenandoah Furnace Co. has secured a charter from the State Legislature to build a railroad from Groves Hill to the Catherine furnace mines.

The Chilhowie Lumber Co. is proposing to build a railroad from Saltville on the Norfolk & Western to Poor Valley, 20 miles, to reach timber lands.

WAYCROSS AIR LINE.—Birch & Schnare, of Fitzgerald, Ga., are reported to have the contract for the extension of this line from Douglas, Ga., northwest about 28 miles to Fitzgerald. (Dec. 8, 1899, p. 854.)

YORKTOWN, POQUOSON & HAMPTON.—The bill to incorporate this company has passed both houses of the Virginia Legislature. The proposed line is from Yorktown to run southeast about 15 miles to the Hampton Roads near the town of Hampton. The incorporators are: Sydney Smith, W. E. Goffigan, T. H. Geddy, W. J. Stores, R. L. Spencer, J. F. Hubbard, W. T. Wainwright, T. S. Harris, T. T. Hudgins, George L. Smith, Frank H. Rocap, J. J. Whispell, J. W. Rogers, J. W. Clements, John Cruikshank, R. W. Shield and Frank Rogers. (Feb. 16, p. 112.)

GENERAL RAILROAD NEWS.

ATCHISON, TOPEKA & SANTA FE.—The property of the Denver & Santa Fe, a subordinate line, has been bought by the Atchison and is to be incorporated as an integral part of the system.

BALTIMORE & OHIO.—The Newark, Somerset & Straitsville property was sold in Newark, O., Feb. 19, to the reorganization committee of the B. & O., for the upset price of $300,000. (Feb. 9, p. 96.)

A 99 year lease of the Chicago Terminal Transfer property has been obtained by the B. & O., which will give the company adequate facilities in Chicago.

CENTRAL PACIFIC.—The company on Feb. 23 anticipated the payment of one of its 20 notes for $2,946,194, which it gave at the time of the settling of the finances of the old company. Four of these notes had been paid previously and this is the fifth, which does not mature until August, 1901. The payment releases a like amount of Union Pacific bonds which were pledged as collateral. (Oct. 13, 1899, p. 720.)

CHICAGO & ALTON.—The bill has become a law in New York placing the bonds of this company on the list of legal investments for savings banks. (Jan. 19, p. 48.)

CHICAGO & WESTERN INDIANA.—One hundred and two first mortgage bonds of Nov. 1, 1879, are called for redemption at the office of J. P. Morgan & Co., New York, on May 1 next, at 105. (March 3, 1899, p. 163.)

DARDANELLE & RUSSELLVILLE.—Articles of reorganization were filed with the Secretary of State of Arkansas Feb. 23. The capital stock is $200,000. The road was reported sold several months ago to a Chicago syndicate. The new directors are: James E. Skillern (President), Hubert C. Mandeville, William M. Telmer, Eben O. McNair, Henry L. Turner, George B. Rose, James K. Perry, Z. J. Pierce and J. K. Barry. All these are new, with the exception of Mr. Perry, who was the old President. (Nov. 17, 1899, p. 802.)

DELAWARE & HUDSON.—The U. S. Supreme Court has affirmed the decision of the New York court of appeals perpetuating the enjoining the Adirondack Railway Co. from right of way through public lands in the Adirondack Park. (Oct. 13, 1899, p. 720.)

FITCHBURG.—At a meeting of the preferred stock holders held at Boston, Feb. 27, a protective committee was appointed to solicit proxies in favor of a lease as follows: Rodney Wallack, W. E. Rice, Frank G. Webster, Charles E. Ware, Louis S. Dabney, Philip Dexter and Gordon Abbott. (Feb. 16, p. 112.)

HOUSTON EAST & WEST TEXAS.—Negotiations are pending by Blair & Co. for the sale of this road to the Southern Pacific. It is proposed to include also the Houston & Shreveport, which was consolidated with the other line by the Texas Legislature last year. The two roads form a line from Houston, Tex., to Shreveport, 232 miles. (May 5, 1899, p. 325.)

NEW ORLEANS & WESTERN.—Judge Parlange in the U. S. District Court at New Orleans, La., on Feb. 21, appointed George C. Prest as Master in Chancery to sell the road at the company's office in St. Bernard's Parish after six weeks' advertising. This was on application of the State Trust Co., New York, trustee, under the $2,000,000 first mortgage. The upset price is $1,000,000. (Oct. 27, 1899, p. 754.)

NORFOLK & WESTERN.—Holders of the $1,000,000 Virginia & Tennessee fourth mortgage 8 per cent. bonds maturing March 1, are notified that the bonds will be bought at maturity by the Mercantile Trust Co., New York. Interest from Jan. 1, 1900, will also be paid. First consolidated 4 per cent. bonds to the amount of $3,876,000 to retire these and other underlying bonds maturing July 1 have been sold. (Feb. 2, p. 80.)

NORTHERN CENTRAL.—The stockholders at the annual meeting on Feb. 23 voted to increase the capital stock from 150,362 shares to 240,000 shares at a par value of $50 per share. This raises the capital stock to $12,000,000. It is proposed to allot 50,000 shares of the new stock to the present stockholders at the ratio of one-third of their present holdings at $70 a share. (Feb. 16, p. 112.)

PITTSBURGH & WESTERN.—Judge Joseph Buffington in the U. S. Circuit Court at Pittsburg, Pa., on Feb. 21 decreed the foreclosure sale of this property under the $3,500,000 second 5 per cent. mortgage of 1891. Interest has been unpaid since November, 1895, which makes the total indebtedness $4,322,234. Wm. R. Blair is appointed Special Master to conduct the sale after six weeks' advertising. The upset price is $3,000,000, and not less than $100,000 in cash or $300,000 in bonds must be first deposited. (Dec. 8, 1899, p. 854.)

ST. LOUIS, PEORIA & NORTHERN.—Major Bluford Wilson, Special Master in Chancery appointed by Judge Allen in the Federal Court at Springfield, Ill., to sell the property of this company and of the Madison Coal Co., has fixed the date of foreclosure at noon March 15 at Springfield, Ill., the upset price being $850,000. (Feb. 2, p. 80.)

SOUTHERN.—The Central Trust Co., New York, will receive bids at a price not to exceed par and accrued interest for as many Georgia Pacific equipment 5 per cent. mortgage bonds of July 17, 1889, as will absorb $54,412. (Dec. 8, 1899, p. 854.)